TECHNOLOGY OF

Grinding and Finishing

october 1957

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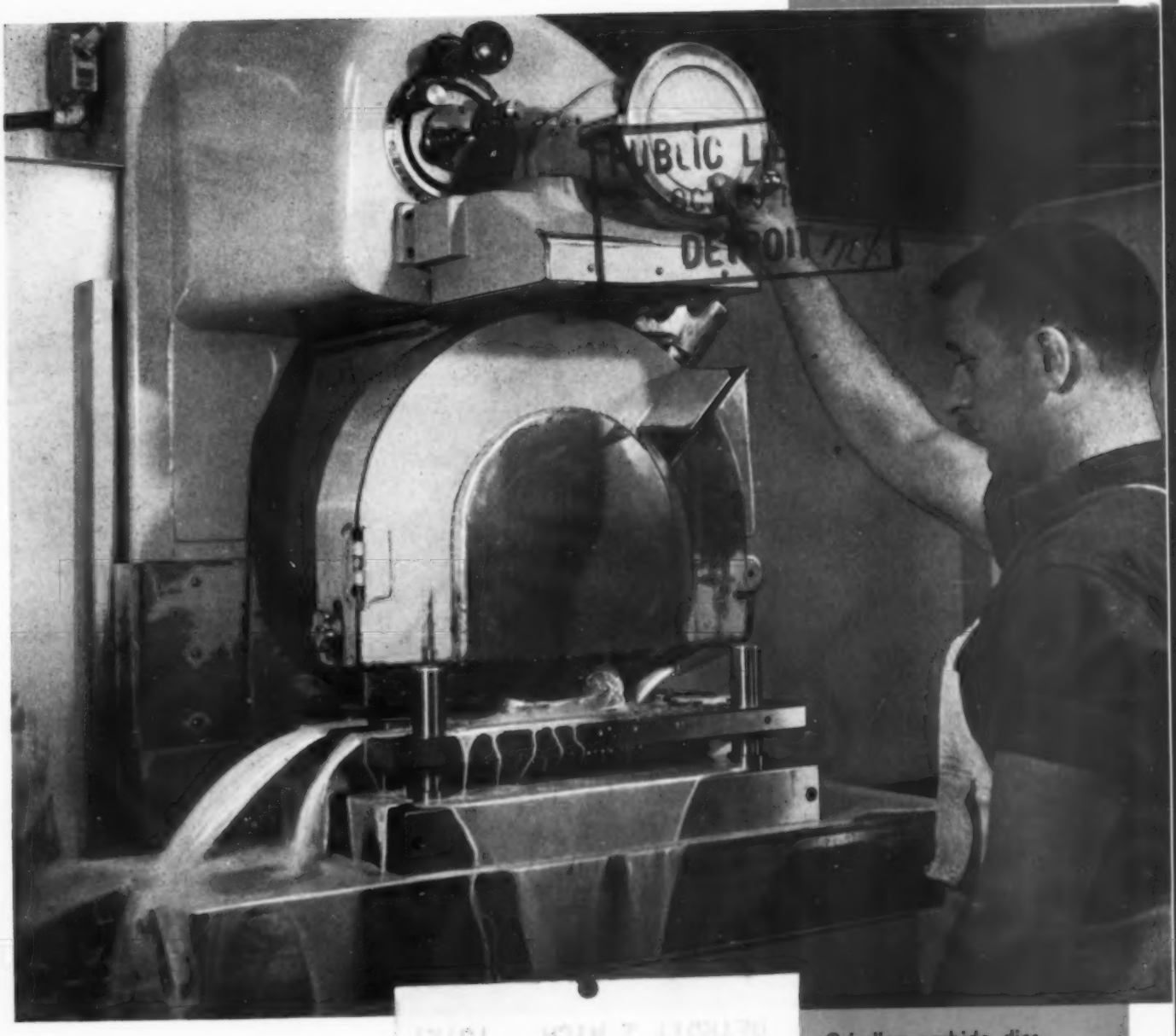
How Ford Aircraft Saves Money on Deburring —page 23

Diaphragm Chucking on Gear Production —page 30

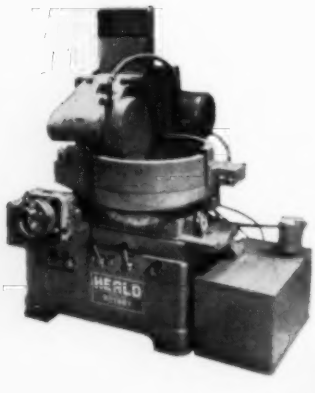
Grinding Thin and Small Parts —page 38



Grinding carbide dies properly involves several factors —see page 34

a hitchcock publication

Large work? Low RMS finish?
Here's a shining example.



The 30" Heald Model 361 Rotary does an outstanding surface grinding job

Take this case for instance. The column-type rotary Model 361-30" is designed to precision surface grind relatively large work. The wheel grinds on its periphery, producing a concentric finish highly desirable in certain applications. The 361 is now available with either a 24" or 30" magnetic chuck, and can easily handle work of the size shown above. This piece has a 2-4 R.M.S. finish and a flatness of .0001 in 30". Send for Bulletin 2-361-1.

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BPA

grinding and finishing

FEATURE ARTICLES

How Ford Aircraft Saves Money on Deburring Operations 23
Costs are reduced 60 to 70 percent. Better uniformity on finished parts is obtained through efficient use of finishing machines and barrels. By Herbert E. Chase

Shot Peening Strengthens Jet Blades 29
A safety precaution performed on parts which receive greatest stress or wear.

Two Applications on How Diaphragm Chucking Speeds Short Run Gear Production 30
How one firm used the replaceable diaphragm-and-jaw assembly for each gear type and another used replaceable gear "cages." By Jack Kenyon.

How to Grind Carbide Dies 34
Dies are expensive. Their life and usefulness can be greatly lengthened by proper grinding practice. Here are some hints and tips gained through many years' experience by the Oberg Manufacturing Co. By Darrell Ward

How to Grind Thin and Small Parts 38
The secret of grinding small or thin parts is not so much in the grinding as in the holding of the part. Here are some practical case histories of how others have solved the problem. By Roger Perry, Jr.

DEPARTMENTS

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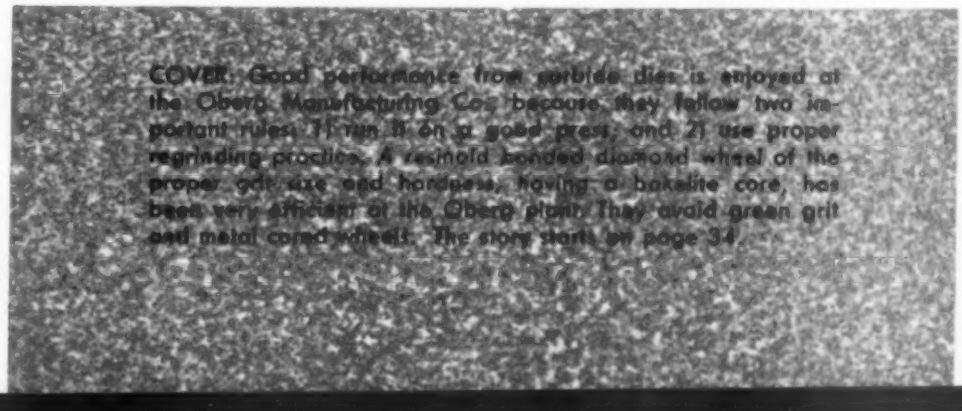
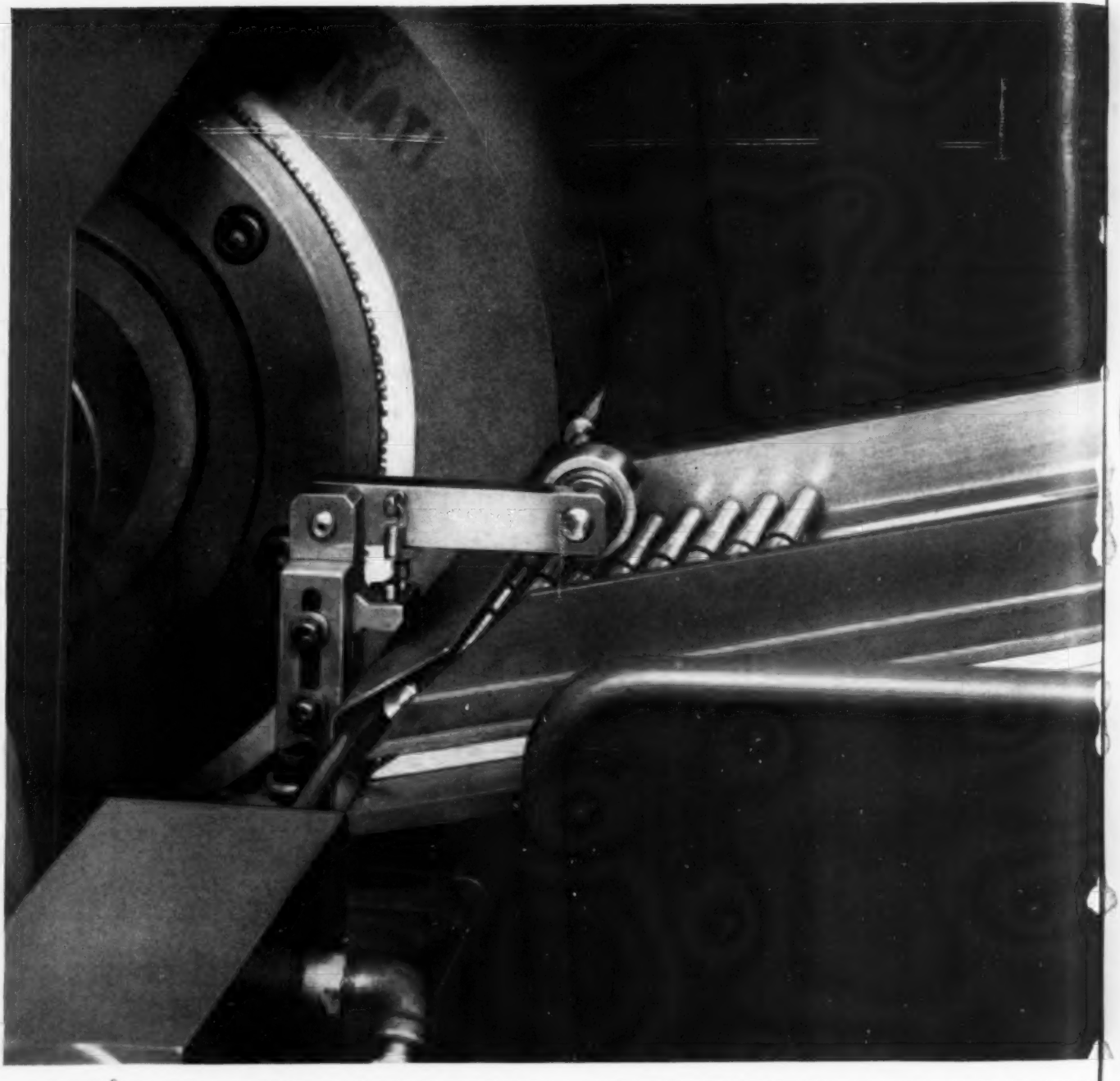


COVER: Good performance from carbide dies is enjoyed at the Oberg Manufacturing Co. because they follow two important rules: 1) run it on a good press, and 2) use proper regrinding practice. A resinoid bonded diamond wheel of the proper grit size and hardness, having a bakelite core, has been very efficient at the Oberg plant. They avoid green grit and metal cored wheels. The story starts on page 34.

Cincinnati Filmatic



Five sizes of water pump shafts are automatically ground on the CINCINNATI FILMATIC No. 2 Centerless illustrated above. Tooling by Cincinnati includes an Electro-Hydraulic Automatic Infeed Attachment and magazine type work loading fixture arranged to handle five sizes of parts. The largest shaft is ground in two passes; one pass for the small shafts. Production: 240 per hour per pass at 80% efficiency.

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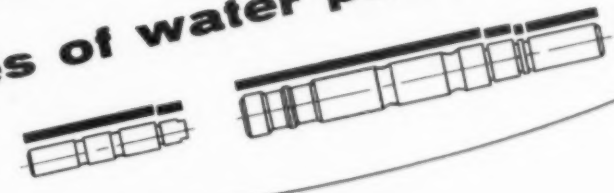
The No. 2 is the machine for this job ... automatically grinding five sizes of water pump shafts



FILMATIC

Multiple diameter jobs are "naturals" for CINCINNATI® FILMATIC Centerless Grinders . . . and for Cincinnati's 32 years' experience in centerless tooling. The illustration at the left shows how these two major elements of production — the right machine and the proper tooling — have been combined to reduce the cost of grinding five sizes of water pump shafts. ¶A CINCINNATI FILMATIC No. 2 was selected for the job. All diameters are centerless ground simultaneously; to close limits of accuracy; exactly concentric with each other.

The entire cycle, including loading and ejecting, proceeds automatically, at the rate of five parts per minute.

Much of the outstanding success of centerless grinding this part can be attributed to the machine. FILMATIC grinding wheel spindle bearings cannot deflect under wide infeed cuts; bed rock design for grinding wheel spindle housing withstands maximum hp metal removal; swivel mounting of regulating wheel pile simplifies setups; anti-friction infeed slide reduces maintenance and helps to maintain close tolerances. Want more information? Ask for catalog No. G-644-2. Brief specs for the entire Cincinnati Centerless line are in Sweet's Machine Tool File.

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CINCINNATI 9, OHIO

CINCINNATI FILMATIC
No. 2 CENTERLESS
GRINDING MACHINE
CATALOG No. G-644-2

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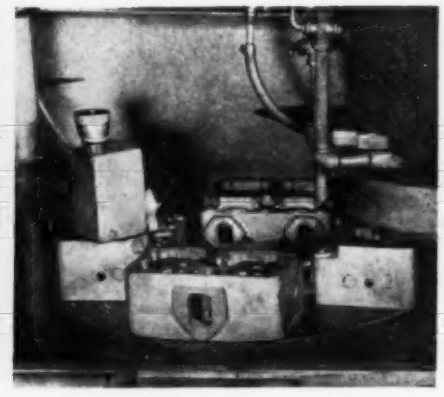
200 adjusting screw washers are ground on one side in one hour. Stock removal .025"; limits ± .001".

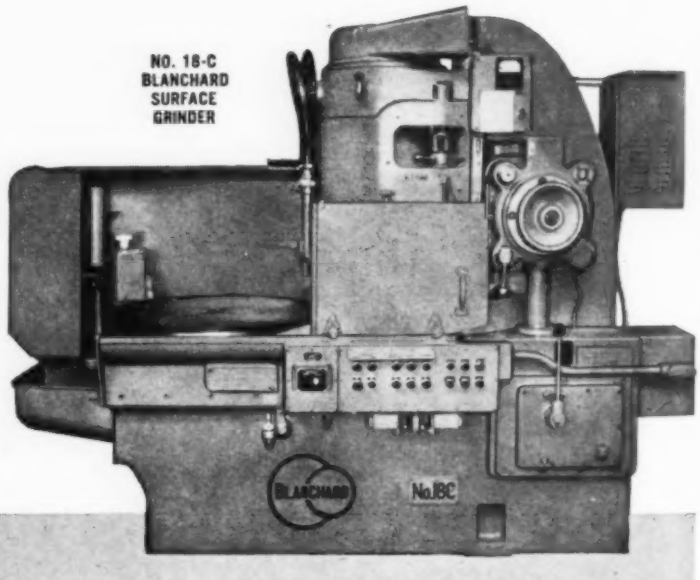


Tops of cylinder heads ground 21 per hour; stock removal 3/16" to 1/4". Bottoms 55 per hour; stock .012"; limits ± .001".

56 cast iron plates are ground on one side in one hour. Stock removal .140"; limits .001".

for best results...

The Blanchard No. 18-C Surface Grinder has the speed and precision that guarantees economical grinding on an endless variety of jobs. After the initial setup, the automatic cycle handles every operation from start to finish. The operator is freed to prepare the next load or to operate a second No. 18-C Grinder.



NO. 18-C BLANCHARD SURFACE GRINDER

Put it on the Blanchard

The 18-C Automatic Cycle...

Moves chuck to grinding position and starts it rotating

Starts wheel rotation and coolant pump

Provides rapid wheel approach to work

Engages power down-feed at preset rate

Changes to fine feed just before finished size is reached

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Stops wheel, coolant pump, and chuck

Moves chuck to loading position—demagnetizes chuck

Can be changed quickly to manual operation

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Letters to the Editor

Soluble Coolants

I have read with interest in the June and July issues of GRINDING and FINISHING magazine the article by Messrs. Gould and Ball entitled "How to Dispose of Soluble Coolants."

Inasmuch as the City of Battle Creek, like all other industrial communities, has an increasing problem in treating and disposing of this type of waste, it would be very much appreciated if you would send reprints of these two articles to Mr. R. R. McIntosh, Director of Public Works, and Mr. Dean Sherriff, Industrial Waste Control Chemist, Battle Creek, Mich.

Your cooperation in this regard will be very much appreciated.

T. C. MacCalla, Jr.
Vice Mayor
City of Battle Creek

Portable Air Grinders

We have received the all member bulletin dated August 21st released by Compressed Air and Gas Institute, regarding reprint articles. As a member of this group we would appreciate it if you would send this office 12 copies of "How Much Does It Cost to Run Your Portable Air Grinders."

We believe these will prove very useful in our service. Thank you.

V. G. Turner
Thor Power Tool Co.
New York, N.Y.

. . . will you please send us a copy of the article "How Much Does It Cost to Run Your Portable Air Grinders," which appeared in your August, 1957 issue.

J. F. Corkery
Vice Pres.,
Thor Power Tool Co.
Chicago, Ill.

. . . we would appreciate very much your forwarding to us twelve copies of the article "G M Designs a Finishing Machine," which appeared in your August, 1957 issue.

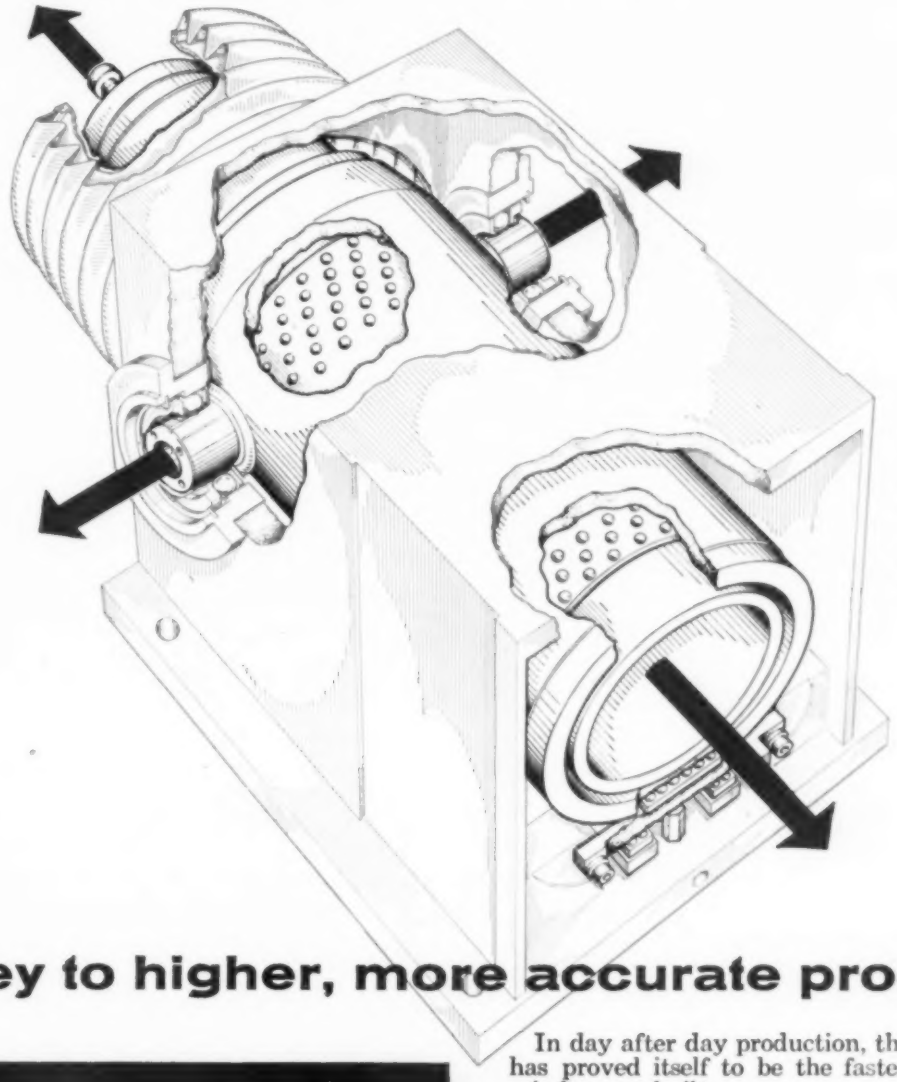
Thank you very much for your attention to this request.

H. J. Miller,
General Manager
Miller Machine Tool & Gage Shop
Glendale, Calif.

Meet T. D. DETHEROW

. . . one of Bryant's experts on internal grinding of all types. Tom, who has been with Bryant for 17 years, is in charge of the Chicago territory.

CENTALIGN *offers more than any other internal grinder!*



Exclusive anti-friction pre-loaded ball slide construction, incorporating both traverse and cross-feed motion.

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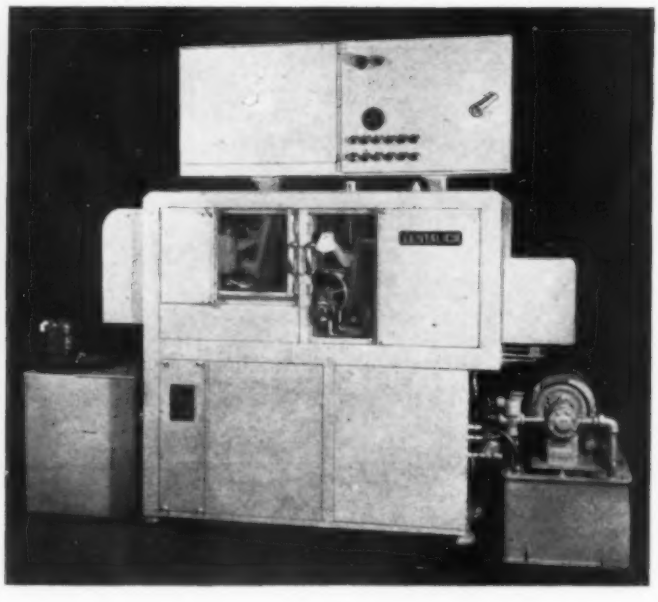

In day after day production, the Bryant Centalign* has proved itself to be the fastest precision internal grinder ever built.

Compare the Centalign and its completely new design with any other internal grinder. Your analysis will show that only the Centalign offers these and other important features which result in higher production and increased accuracy:

- Wheelslide construction with grinding forces directly opposed on the same plane in which they are applied. Deflection caused by cantilevers is completely eliminated.
- Split-second cycle control by a simple cam unit which may be quickly adjusted when cycle changes are required. The complete unit may also be stored, and interchanged as a pre-set program.
- Simple servo-controlled hydraulic actuation of the wheelslide traverse. Power is applied directly on the center line of the wheelslide, avoiding objectionable side forces.

The Centalign is available in standard models for grinding straight bores, tapered bores or forms such as ball tracks. For high production contour bore grinding, custom-designed vertical Centaligns are available.

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*T. M. Reg. U. S. Pat. Off., The Bryant Chucking Grinder Co.

BRYANT Chucking Grinder Co.

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May we help you?

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You'll find wheel-making at its best in Cortland Centerless Grinding Wheels. They hold shape, yet cut freely for rapid and accurate production with minimum dressing.

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And once *your* Cortland wheel specification has been established, you can reorder with perfect assurance that each succeeding lot will be exactly like those which have given you such satisfactory performance.

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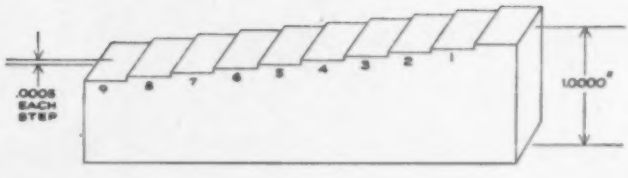
New Step-Block Test Shows .000012″ Downfeed Accuracy on Taft-Peirce No. 1 Grinder



This is the Taft-Peirce No. 1 Precision Surface Grinder. It offers the exclusive tilting wheelhead plus a selection of seventeen different attachments for all-purpose application. Operators easily grind to .0001″, and to .00005″ with experience. Surfaces are so smooth they seal without lapping.

Gagemaker tolerances easily produced with exclusive T-P Vernier Fine-Feed — for tool room or small parts production.

Tests of grinding accuracy on a Taft-Peirce No. 1 Grinder constantly prove the remarkable accuracy of this machine. The latest — a step-block demonstration — shows just what tolerances you can expect.

A four inch long block was ground to a height of 1.0000″, then nine consecutive steps in depth increments of .0005″ were ground, using the Vernier Fine-Feed. Result: Inspection of height at each step revealed an average error of only .000012″! A T-P Versachek Electronic Gage with 4000:1 magnification was used for inspection.

This remarkable downfeed accuracy offers superlative results for tool, die, and gage work; as well as for small parts production. Plan now to add this all-purpose precision grinder to your facilities — send for Data Sheet MT-001 and Catalog.

TAKE IT TO TAFT-PEIRCE

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"What a difference CDP* makes"

Over and over we hear this from people after they try (and then standardize on) KOEBEL CDP* dressing tools for grinders.

CDP* tools are different—IN ECONOMY

- you use up every point and piece of every diamond particle.
- there is no wastage. CDP* gives the most efficient use of diamond caratage conceivable.
- you eliminate diamond resetting.
- you get more pieces per dressing.
- longer wheel life cuts wheel costs.
- you cut diamond tool costs (see example).

CDP* tools are different—IN PERFORMANCE

- there's a big difference in results (see typical example).
- they even do jobs big single diamonds can't do efficiently.
- they take the guesswork out of diamond performance by insuring *uniform* results, tool after tool.

* CDP—Cemented diamond particles—small diamond particles set into a matrix which automatically adjusts itself to diamond wear.

Yes, CDP* tools are different

- there is no quality variation in CDP* dressing tools.
- it is their design and manufacturing uniformity that gives you such uniform results.

A typical wheel dressing example

	Single Diamond	CDP* Dresser
Life	5 days	60 days
pcs/dressing	12	25
cost/100 pcs.	1.7 cents	0.5 cents

(½ the tool cost per piece, half the wheel cost, less downtime and double the wheel life.)

CDP* tools take the guesswork out of diamond tools and convert them into WORKHORSES OF INDUSTRY. What carbides did for machining, CDP* tools are now doing for grinding.

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KOEBEL DIAMOND TOOL CO.

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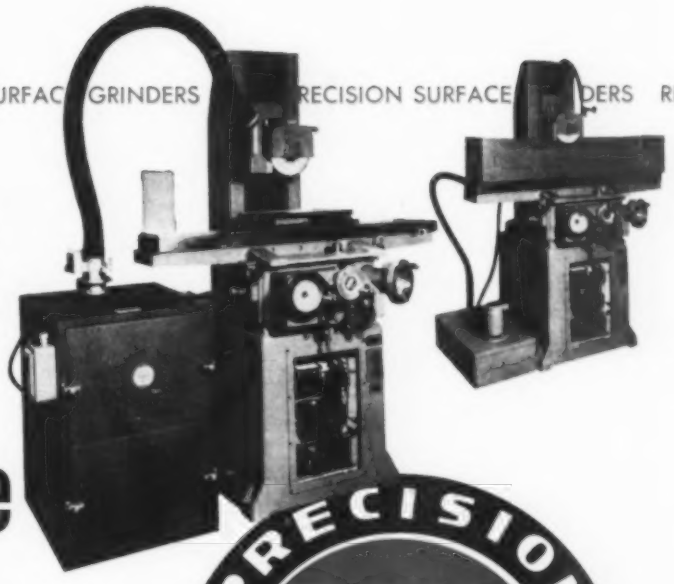

MODEL 618P
(large illustration)
with dust collector,
and (small illustration) with
wet grinding attachment.

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PRECISION REID SURFACE GRINDERS

REID-O-MATIC 824

Bulletins
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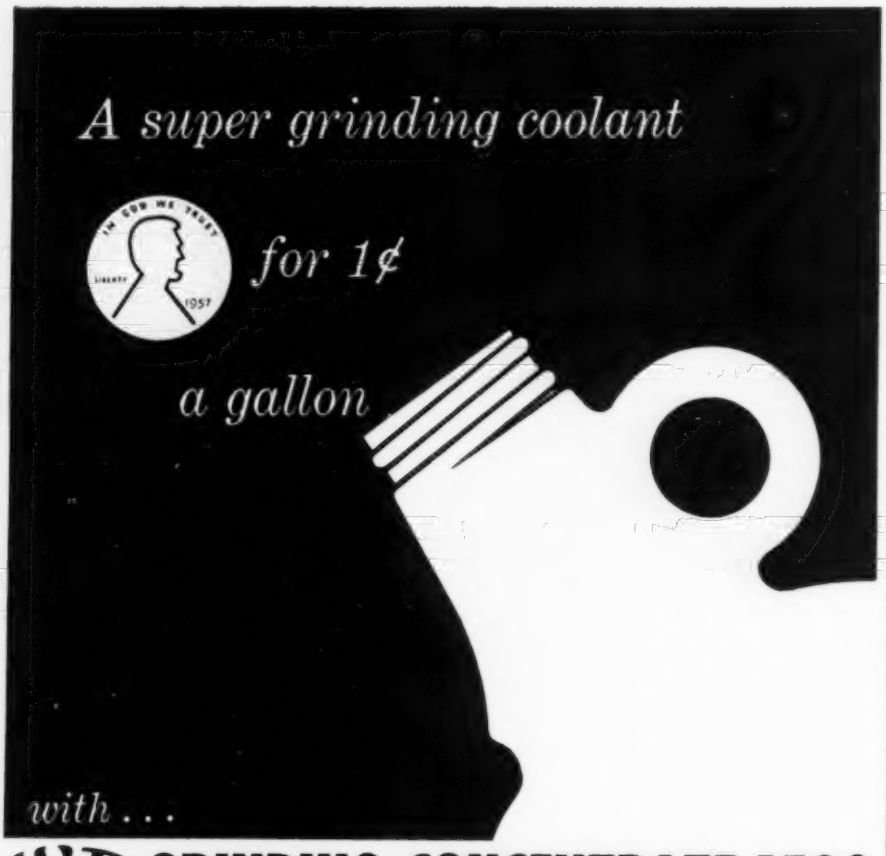

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Normal dilution for this entirely different type of coolant is from 150 to 200 parts of water to 1 part W & B Grinding Concentrate 1500. And since W & B 1500 is used in extreme dilutions, one 55-gallon drum provides up to 11,000 gallons of grinding coolant — at a cost of about 1¢ a gallon.

Foamless as water, W & B 1500 gives excellent rust protection and provides a transparent mix that really keeps wheels open. Grinding is keener . . . machines stay cleaner. Chips settle almost instantly. Get complete information on this outstanding grinding concentrate. Fill out and return attached coupon.

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☐ My plant has a tricky grinding problem on which we'd like advice. I've attached a letter describing it in detail. I understand that you offer this service without obligation.

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Industry Observer

• *Capital spending*—After an uninterrupted three-year upsurge, is American industry's spending on new plants and equipment due for a decline? Manufacturers now have ample capacity in almost every line, so it seems reasonable to suppose that outlays will taper off next year. Industry's capital spending in '56 reached a new high at over $35 billion. Government statisticians calculate that total spending this year will shatter the 1956 record. Although some companies are thinking of snipping their spending plans, many others are plunging into expansion programs of prodigious magnitude. The International Business Machines Corp., New York, for example, is spending $200 million for improvements this year and expects to top that figure in 1958. Union Carbide & Carbon plans to increase its budget next year also; their new plant outlays for '57 come to $180 million. The Bell System expects to repeat its 1957 expenditures in 1958—a hefty $2.5 billion. Other companies forging ahead with expansion plans include: American Gas & Electric Co., New York; Caterpillar Tractor Co.; Western Air Lines, Inc., Los Angeles; National Cylinder Gas Co., Louisville, Ky.; Pennsalt Chemicals Corp., Philadelphia; Bay State Abrasive Products Co., Westboro, Mass. This report of old Doc Economy's prenatal examination certainly seems to indicate that 1958 is developing into a husky, healthy child.

• *The old system of coding diamond wheels* has become outmoded by the new American Standard Identification Code sponsored by the Industrial Diamond Association of American, Inc., Grinding Wheel Institute. Users of diamond wheels will want a copy of the new code, as described in the "Free Literature" section of this issue of GRINDING and FINISHING.

(Continued on page 12)

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mounted wheels

are America's finest

Chicago Wheels are available in all standard sizes and over 200 special shapes. This wide selection of these tough, fast cutting Chicago Mounted Wheels makes it possible for you to choose just exactly the right mounted wheel for your job. And delivery of most Chicago Mounted Wheels is prompt . . . right out of stock.

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GUARANTEED to stay on their mandrels, they are perfectly balanced, easily dressed, and hold their shape.

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Chicago Wheel and Mfg. Co.

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Firm Name .....

Street Address .....

City ..... Zone ..... State .....

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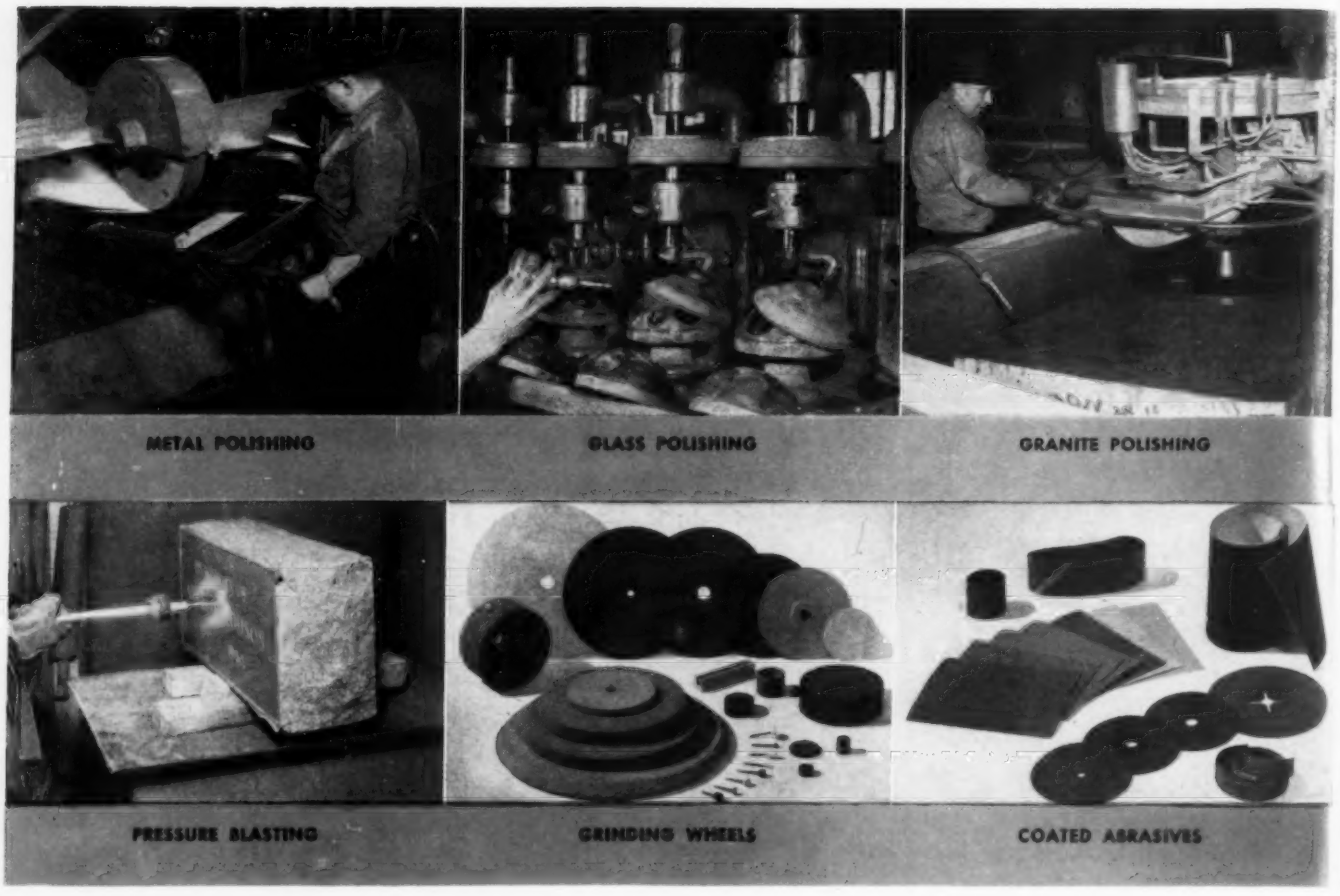

There is an EXOLON Abrasive

to meet EVERY Finishing Requirement

Whatever the product, whatever the desired finish . . . there is an EXOLON Abrasive that produces the desired results quickly, uniformly and at lowest costs.

Abrasive Grain: EXOLON (Aluminum Oxide) and CARBOLON (Silicon Carbide) are accurately graded, free of iron impurities and well shaped for liquid blasting, barrel finishing, air blasting or wire sawing. There is an EXOLON Abrasive Grain for fast cutting, finishing or polishing all metals and for such materials as glass, stone and plastics.

EXOLON also makes quality controlled abrasives for the manufacture of grinding wheels, refractories and coated abrasives.

For the best in abrasives always specify EXOLON.

In our three laboratories we have complete facilities for research and development on abrasives and their use. Our technical staff will be glad to assist on any problems in the use of EXOLON or CARBOLON.

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Manufacturers of SILICON CARBIDE *and* ALUMINUM OXIDE ABRASIVES

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BROWN & SHARPE standard design of the No. 11 Face Grinder provides all basic features needed for FULL AUTOMATION at Thompson Products

NO. 11 FACE GRINDING MACHINE is used in a fully automated production line, between centerless grinding and polishing operations.

OPERATION is grinding one face of cylindrical parts for automobile power steering assemblies.

AUTOMATIC CYCLES and work-handling equipment eliminate manual operations. Grinding, wheel-dressing, work loading and unloading are fully automatic. Machine stops automatically, when minimum usable diameter of grinding wheel is reached, for replacement of the wheel by the operator.

SPECIAL TRANSFER ARM has two chambers, swings down to unload finished part into one chamber, and load chuck with unground part from other. At top of travel, the arm ejects finished part into track to next operation, and loads unground part, for transfer to chuck. Chuck is flushed with filtered coolant after each unloading.

AUTOMATIC PRESET GRINDING CYCLE includes rapid advance, wheel feed, spark out, and rapid retraction.

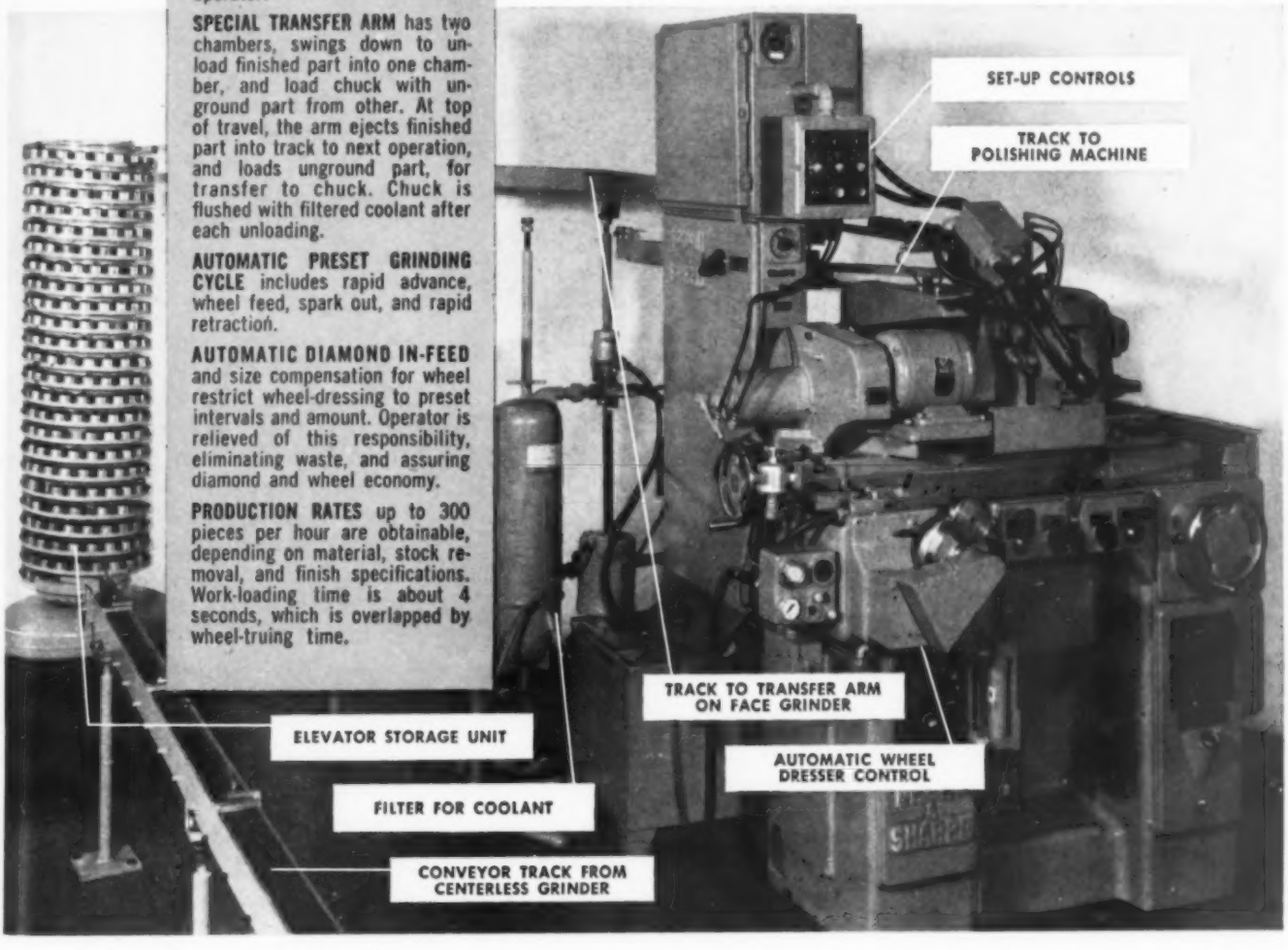
AUTOMATIC DIAMOND IN-FEED and size compensation for wheel restrict wheel-dressing to preset intervals and amount. Operator is relieved of this responsibility, eliminating waste, and assuring diamond and wheel economy.

PRODUCTION RATES up to 300 pieces per hour are obtainable, depending on material, stock removal, and finish specifications. Work-loading time is about 4 seconds, which is overlapped by wheel-truing time.

Rapid and costly obsolescence of special machines can be avoided when you start with a *standard* machine that permits designing for any degree of automatic operation.

At Thompson Products, the No. 11 Face Grinding Machine, completely automated with the addition of special automatic cycles and work-handling equipment, meets full production demands for power steering parts used by a leading automobile manufacturer.

If specifications should be changed, or if the part is eliminated, the machine can be reconverted for revised special requirements, or for standard operations, without major expense.


SET-UP CONTROLS
TRACK TO POLISHING MACHINE
TRACK TO TRANSFER ARM ON FACE GRINDER
AUTOMATIC WHEEL DRESSER CONTROL
ELEVATOR STORAGE UNIT
FILTER FOR COOLANT
CONVEYOR TRACK FROM CENTERLESS GRINDER

The No. 11 Face Grinder without special equipment is setting new production records on a wide range of face grinding jobs — employing only the standard features which permit a semi-automatic grinding cycle and preset wheel dressing control. Find out how it can lower your costs.

Brown & Sharpe design specialists will survey your grinding operations at your request. Let them show you how to make your machine investment pay the highest return . . . in productivity, in lasting economy. Write: Brown & Sharpe Mfg. Co., Providence 1, R. I.

The home of PRECISION CENTER B·S

Brown & Sharpe

MILLING, GRINDING, AND SCREW MACHINES • CUTTERS • MACHINE TOOL ACCESSORIES • PRECISION TOOLS • PUMPS

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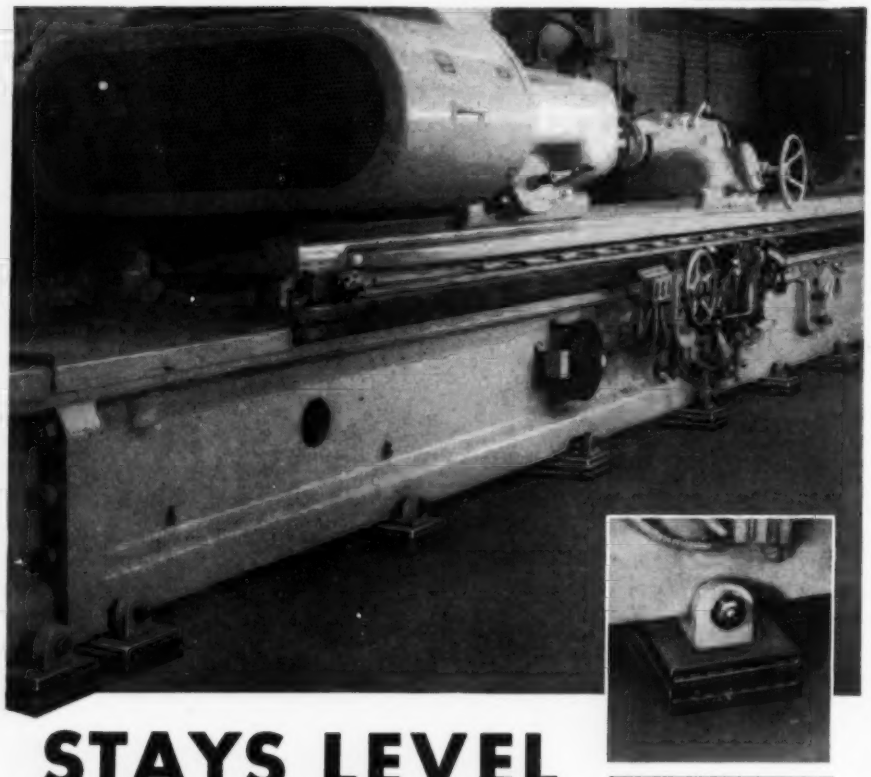
45-TON GRINDER INSTALLED ON Air-Loc 4·17·4

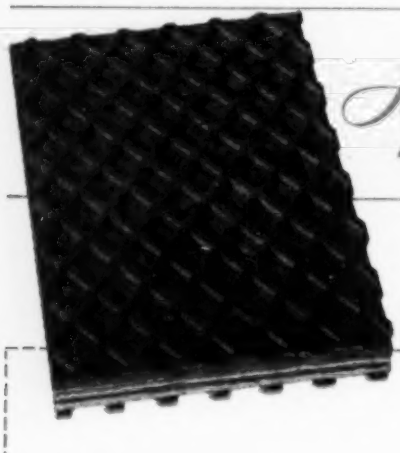


Insert shows use of Air-Loc and leveling plates. No bolts or cement needed.

STAYS LEVEL TO .0005"

This Norton Grinder, installed on 26 AIR-LOC mounts, is regularly checked for level at 3-month intervals . . . and always holds the .0005" level required by manufacturer's specifications, with no adjustments necessary.

Jigborers, grinders, lathes . . . all of your fine tolerance precision machines . . . should be installed on AIR-LOC to safeguard the accuracy originally built into them by the manufacturers.



Air-Loc 4·17·4

You get a permanent precision installation with patented AIR-LOC mounts that *Resist* oil, water and alkali, *Permit* easy leveling, *Eliminate* need for bolts or cement, *Hold* machines in place, *Reduce* transmitted vibration from the floor.

Return Coupon for Air-Loc Samples and Booklet.

AIR-LOC DIVISION
Clark-Cutler-McDermott Company
Franklin, Massachusetts

NAME..... TITLE.....
(Please Print)
COMPANY.....
ADDRESS.....
CITY..... ZONE..... STATE.....

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Industry Observer

(Continued from page 12)

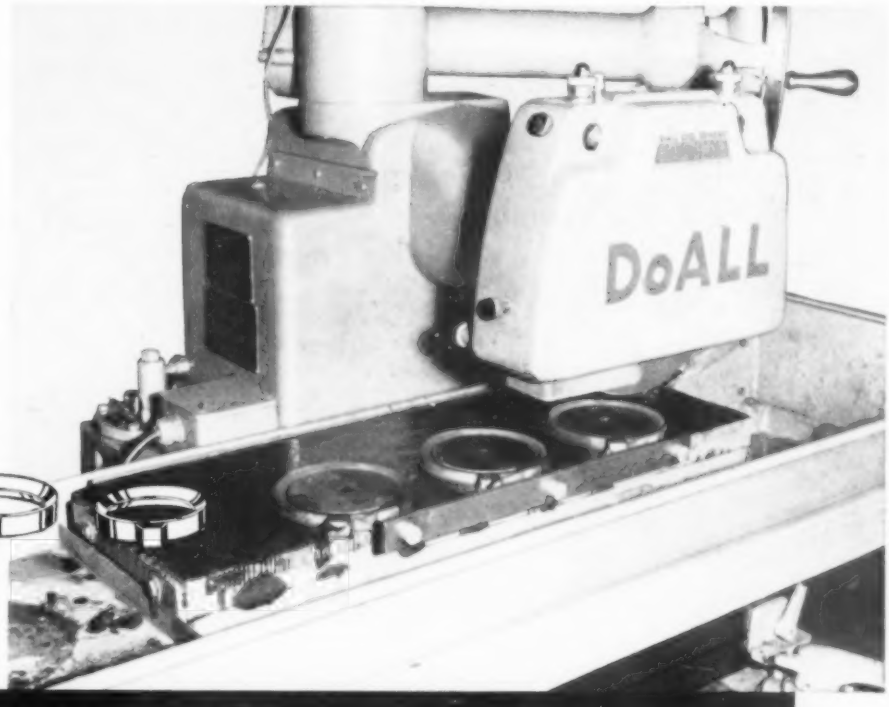
• *Improving community business* – Is your town suffering from business doldrums? If so, you need to know: (1) the best way to analyze the factors which affect the volume of business being done in your community; (2) how to stimulate new business. These and other problems will be discussed at each of a series of meetings coming your way this fall. Sponsored by the Chamber of Commerce, these "Local Chamber Leaders Workshops" have drawn an audience of over 17,200 business and professional men since their inception in 1953. Future area meetings have been scheduled as follows: Oct. 7, Portland, Me.; Oct. 8, Irvington, N.J.; Oct. 10, Erie, Pa.; Oct. 14, Wichita Falls, Tex.; Oct. 17, Alexandria, La.; Oct. 29, Lansing, Mich.; Oct. 30, Rockford, Ill.; Oct. 31, Centralia, Ill.; Nov. 5, Beverly Hills, Calif.; Nov. 6, Fresno, Calif.; Nov. 8, Riverside, Calif.

•*New businesses for* 1957 are trailing 1956 by 4.6%. New corporations for July, however, slightly exceeded that month last year, the first such lead since January. A recent study of new firms in Connecticut revealed that 75% had fewer than five employees—including owners—when they began manufacturing. The median capital investment was $7000. Advantages of a corporate structure made it the most common form of organization.

• *Attracting new business*—Chamber of Commerce President Philip M. Talbott, speaking before the Tulsa, Oklahoma, Chamber of Commerce recently, said that neglect of certain "intangible" elements has kept industry out of many communities having good transportation, adequate water supplies, and plenty of raw materials. He emphasized the importance of such elements of the business climate as fair tax laws, good labor relations, and favorable public attitudes toward business. "Excessive and discriminatory regulation of business," he said, "is a red flag to employers."

Can Your Surface Grinder Do This?

Hold .0005" Accuracy and .0002" Parallelism in One pass over these 3½" diameter rings



The DoALL GRINDER Does IT EVERY TIME!

Here's another "proof positive" success story for DoALL surface grinders! The Taber Instrument Corporation of North Tonawanda, N. Y., subcontracts the precision surfacing of helicopter rings which have to be held to "tenths."

Forged and heat-treated rings come to the Taber plant slightly warped, where the grinding operation not only has to provide flat parallel plane surfaces for subsequent machining operations but also bring the thickness to the desired finished size. Using an ingenious fixturing device, the operator surface grinds one side using 1/32" cross feed and a .005" deep cut. The other side of the rings are then ground to bring them to final size in one pass holding dimensional accuracy consistently to .0005" and parallelism to within .0002".

Let us show you how the DoALL grinder takes the guesswork out of your surface grinding. It has rigidity, reliance on hand wheel setting and "Cool Grinding."

ASK FOR A FREE DEMONSTRATION — Compare a DoALL with any surface grinder in your shop. See it in operation on a DoALL demonstration unit right in your own plant. Call your local DoALL Store or write.

FREE MOVIES — Sound and color to show you the ultimate in precision grinding. Call DoALL locally or write.

FREE CATALOG — Shows design and construction of DoALL Grinders and accessories including "Cool Grinding."

GR-21

Find Your DoALL Store In The 'Yellow Pages'

The DoALL Company, Des Plaines, Illinois

THIS IS A TYPICAL DoALL STORE

Call Your DoALL Service-Store

MACHINE TOOLS ..... CUTTING TOOLS ..... MEASURING INSTRUMENTS ..... SHOP SUPPLIES IN STOCK

"Visit our Booth No. 360—Metals Show, Chicago, November 4-8."

Use postpaid card. Circle No. A1

The "RIGHT COMBINATION" for every reinforced grinding wheel

. . . because Norton builds the "TOUCH of GOLD" into it

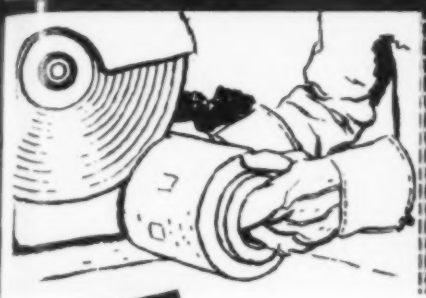
For every grinding, cutting-off or slotting job where you need a reinforced wheel, there's one Norton wheel that will do it best.

Norton helps you make more money by supplying a complete line of reinforced wheels. You get the size, the abrasive, the reinforcing web and the rubber or resinoid bond best suited to the work. Such a wheel puts the "Touch of Gold" in your hands for better production at lower costs.

. . . because Norton builds in Strength and Safety

These pages can't begin to show the many combinations to be found in Norton Reinforced Wheels, mounted wheels and points and sticks.

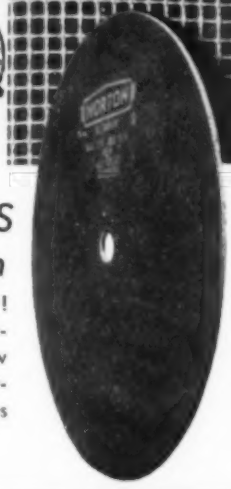
Norton makes so many varieties you can enjoy the just-right combination you're after. This "combination" lets you work fastest . . . safest . . . and most profitably. It's your advantage in dealing with the world's largest supplier of abrasives.

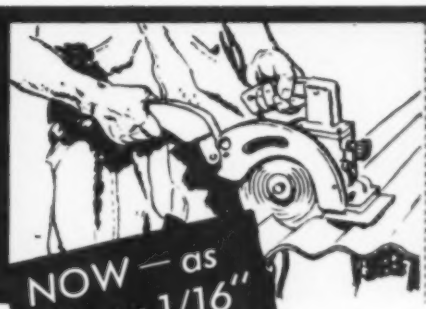


NEW

RN WHEELS
Glass Cloth

New — for the foundry and lower priced! Norton has been field-testing a new rubber-bonded-reinforced wheel. It's ready now and well worth your investigation for savings in your cutting-off operations on ferrous and non-ferrous metals.

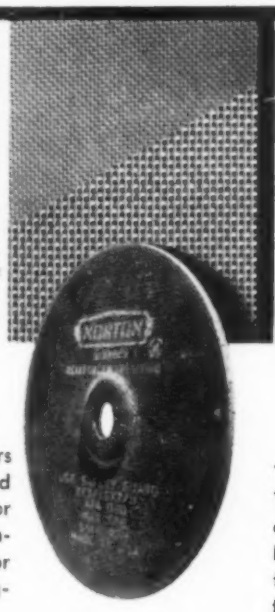




NOW — as thin as 1/16"

BN WHEELS
Glass Cloth

Ten inch diameter wheels can now be had 1/16" and 3/32" thick. In this range specify A36TBN. For heavy duty work, requiring larger, thicker wheels, specify A24R14BN. Use them for slotting, for cutting-off non-ferrous metals, wire rope, many non metallic materials.

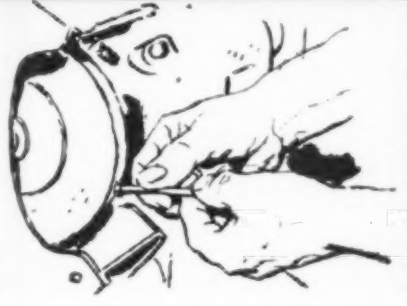


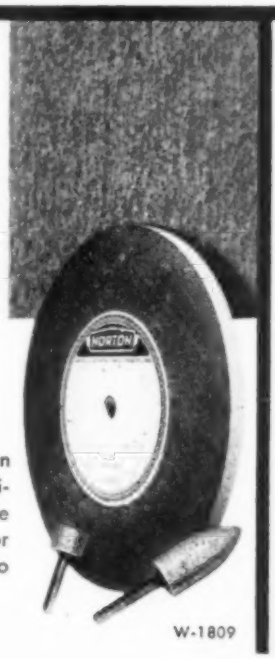
BD WHEELS
Glass-Nylon

For fastest cutting on right-angle grinders you'll want the glass cloth reinforced resinoid bonded hub wheels of rigid type. Use for medium to heavy weld grinding and smoothing flame-cut edges. Specify A24NBD for fast cut, A24QBD for long life. For cutting-off, A24RBD which is Nylon reinforced.

BFR WHEELS
Cotton-Nylon

Top performers for light, portable grinding. These semi-flexible resinoid wheels have cotton fabric with an additional layer of Nylon for added safety. Specify A24KBFR for weld smoothing, removing scale, light finishing, minor cut-off jobs, etc.





BF WHEELS
Cotton

These resinoid straight wheels with cotton fabric reinforcement are "the right combination" for peripheral grinding, do a fine job of deburring and finishing. Fine for blending and smoothing light welds. Also available in mounted wheels and sticks.

W-1809

Also, Reinforced Mounted Wheels and Sticks

See your Norton distributor for further facts about reinforced abrasive products. Ask him for Booklet No. 1748. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS

Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION:

Coated Abrasives • Sharpening Stones • Behr-cat Tapes

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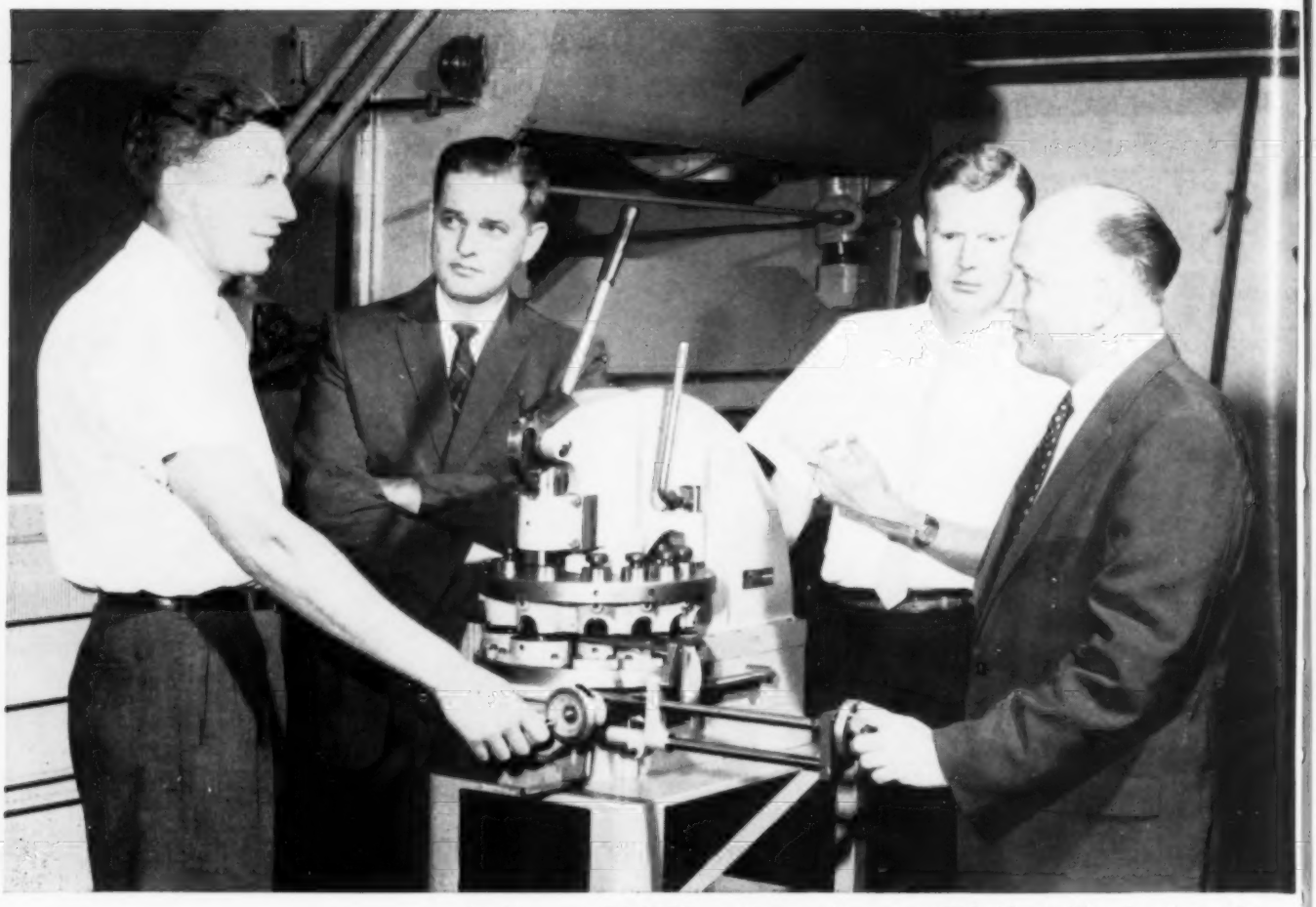


Looking over DI-ACRO punch press features at O'Neil-Irwin Mfg. Co., Lake City, Minnesota are: (left to right) Paul Nelson, Chief Engineer, Bob Bolinder, Hitchcock representative, Richard Maland, Sales Manager for O'Neil-Irwin, and Gunnar Danielson, the company's Vice-President and General Manager.

THE MAN FROM HITCHCOCK

In a recent visit to O'Neil-Irwin Manufacturing Company, Hitchcock's Bob Bolinder got a close-up of the DI-ACRO turret punch press, a modern, new machine tool designed for swift, accurate punching operations. The press provides for instant gauging, and burr free punching at twelve stations.

Because he is an advertising sales representative for Hitchcock publications, Bob is one of the best in the business, with a trade savvy that comes only with experience. And, because Bob takes his job seriously, he keeps a sharp eye on developments in those industries served by Hitchcock publications.

To the advertiser and agency man alike, the man from Hitchcock is more than a space salesman. He is a specialist in his field, a well-travelled individual with an astonishing font of facts that are often invaluable to the industrial marketeer.

If your sales target is the mass transportation, metalworking, or woodworking markets, talk to the man from Hitchcock. He is a member of an aggressive publishing team, who can play an important part in your sales planning.

METALWORKING

Machine & Tool Blue Book
Machine & Tool Directory
Grinding and Finishing
Carbide Engineering

WOODWORKING

Hitchcock's Wood Working Digest
Hitchcock's Wood Working Directory

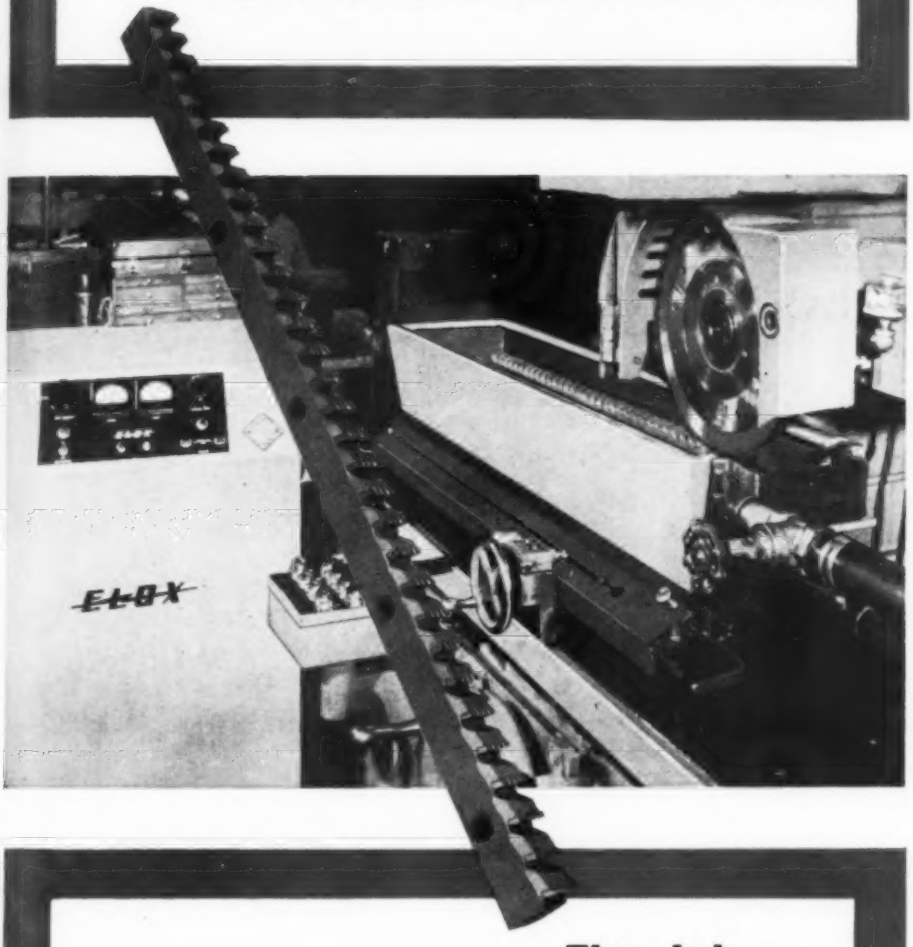
TRANSPORTATION

Mass Transportation
Mass Transportation's Directory
School Bus Trends

hitchcock
PUBLISHING COMPANY
WHEATON • ILLINOIS
SINCE 1898

THE PIONEER OF CONTROLLED CIRCULATION

"elox saves us $294
...8 operations
form grinding this broach"
Ford Motor Aircraft Division



Savings on preformed carbide blanks	$ 32.00
Omitted operations savings	120.00
Diamond wheel savings	142.00
Sums up to	$294.00

The Job...
Broach, used for broaching the pine tree form on turbine blades of the J-57 Jet engine.

NO DIAMOND WHEEL...
EDM substitutes inexpensive brass wheels costing less than $45 for expensive diamond wheels costing a minimum of $150. Brass wheels are formed for $1 as against a diamond wheel contour forming cost of $35.

NO PREFORMED CARBIDE BLANKS...
Conventional machining necessitates preformed tungsten carbide and preformed steel shanks. EDM machines the carbide, brazing material and steel simultaneously, and requires no indexing to assure a perfectly formed broach as to location and size.

OPERATIONS...
Conventionally machined, the pine tree broach requires 22 operations. EDM does it better in 14.

Electrical Discharge Machining has reduced the machining time of this intricate form in 32 carbide tipped teeth to a total time cycle of 33 minutes . . . one-half the time of abrasive grinding. Tolerances held to: +0, —.0002".

elox corporation of michigan *T.M. Reg.
1820 N. STEPHENSON HWY. • ROYAL OAK 3, MICHIGAN

EDM keeps you ahead of competition • Grinding • Die Sinking • Form Grinding • Single Point and Insert Tool Sharpening

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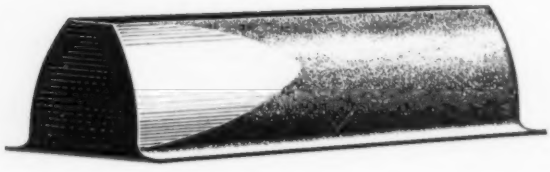
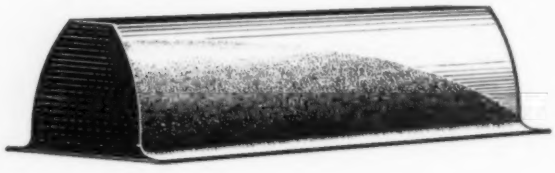
Hard Gear Honing

GIVES YOU BETTER GEARS AT LESS COST

QUICK GEAR INSPECTION

One quick pass with a Red Ring honing tool cleans up the teeth or immediately reveals heat-treat distortions, thus indicating corrective adjustments in the gear forming processes.





CORRECTION OF HEAT-TREAT DISTORTIONS

Minor distortions in tooth profile, helix, index and runout are corrected in from 15 to 60 seconds of honing time.

IN ADDITION

Gear honing provides:

- The Lowest Cost Remedy for Nicks and "Hickies"
- Improved Tooth Surface Smoothness
- Overall Sound Improvement

For Quality Gear Production, write for Bulletin H57-2 which gives the full story on Red Ring Hard Gear Honing.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

7875

WORLD'S LARGEST PRODUCER OF GEAR SHAVING MACHINERY

Use postpaid card. Circle No. 216

Hailed by industry as a major grinding wheel improvement new IL bond acts as an internal lubricant in the wheel providing the fast cutting action of a softer grade, plus the long wear of a hard wheel. For rough snagging on swing frame, floor stands and portable grinders. Write for snagging bulletin ESA 62.

SIMONDS ABRASIVE COMPANY

Tacony & Fraley Sts., Philadelphia 37, Pa.

Division of Simonds Saw and Steel Co.

BRANCHES: PHILADELPHIA • CHICAGO • DETROIT • SHREVEPORT • LOS ANGELES
SAN FRANCISCO • PORTLAND, ORE.

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CALL
YOUR SIMONDS DISTRIBUTOR

P roven products
D ependable know-how
Q uick supply

HILL GRINDING AND POLISHING MACHINES

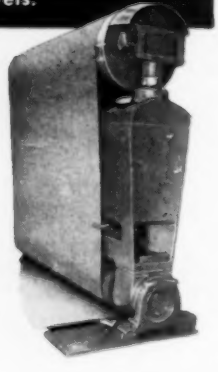
For FINISHING

Any and All

FERROUS and NON-FERROUS MATERIALS . . .

HILL Polishing Machine
(Hydraulic Table Type)
For polishing individual sheets and plates. Hydraulic reciprocating table with centralized controls.

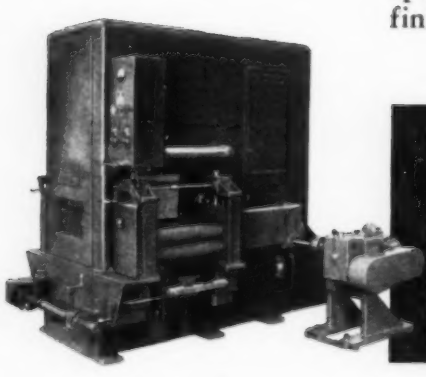
The basic HILL two-roll vertical head with upper steel idler roll and lower rubber covered contact or work roll (both dynamically balanced) over which the endless abrasive belt travels.



FLAT surfaces of ferrous or non-ferrous material can be brought quickly to the high finish so necessary for today's industrial and consumer products. The dairy, automotive, home appliance and engraving industries are typical of the wide range of application for these precise, labor saving machines.

HILL abrasive belt grinding and polishing machines are built in two general types. The hydraulic reciprocating table type polished individual sheets and plates. Table widths vary from 36″ to 60″. Table lengths range from 60″ to 240″. The Pinch-Roll type is for progressive line polishing. The HILL two-roll vertical head with endless abrasive belt is the basic principle common to both types.

When writing for information please indicate size and specifications of stock to be finished.



HILL Grinding and Polishing Machine
(Pinch-roll Type)
For pre-finishing, conditioning and polishing. Used as single units or in multiple units for progressive line polishing in wet or dry operations.

HILL TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

HILL DIVISION
ESTABLISHED 1882
1201 West 65th Street • Cleveland 2, Ohio

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

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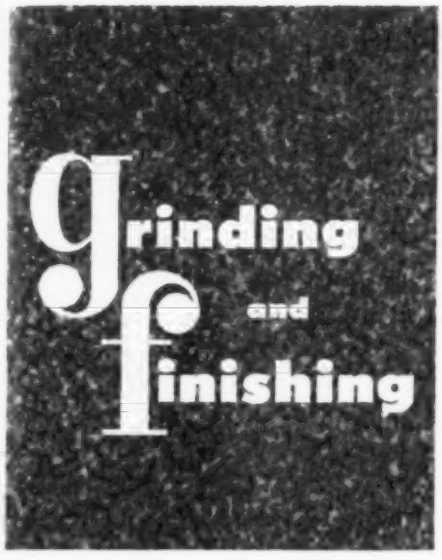


Editor's Page

Better Things Ahead for G & F

To us a new year begins around Labor Day rather than on January 1. The summer lull is behind us, the children are off to school, the lawn mower will soon be put away, the pleasant summer days are fading and we gird ourselves with new enthusiasm for the autumn and winter days ahead. The time has come for the execution of those monumental projects which we so blithely had labeled "Tackle After Labor Day." Alas, the things we planned during summer's indolence sometimes fall a bit shy of monumental!

And yet, the editors of GRINDING and FINISHING approach the coming months with a great deal of enthusiasm. New departments are under consideration, the editorial staff will be enlarged and many new types of major articles are being projected.

We plan to do a great deal with Toolroom Grinding, hoping for a regular department each month. The same applies to rough grinding as applied to foundry and steel mill work. Even now our field editor, Darrell Ward, is in Pittsburgh stalking material on automatic billet grinding. It is hoped the Rough Grinding section, including snagging, swing and weld grinding will be a monthly feature.

Because so many questions are received by GRINDING and FINISHING editors each month it is hoped that a Question and Answer department may now at long last be started.

In addition, we plan more material on process engineering, cost control, managerial and foremanship functions as they relate to abrasive operations. We think we'd like to present more human interest material, realizing you, our readers, are human beings first and engineers secondly.

Admittedly, our mouths are bigger than our stomachs! But if this were not true no progress would ever be made on any front; it is only when we strive to do more than we think we can handle that we achieve more than we dreamed of.

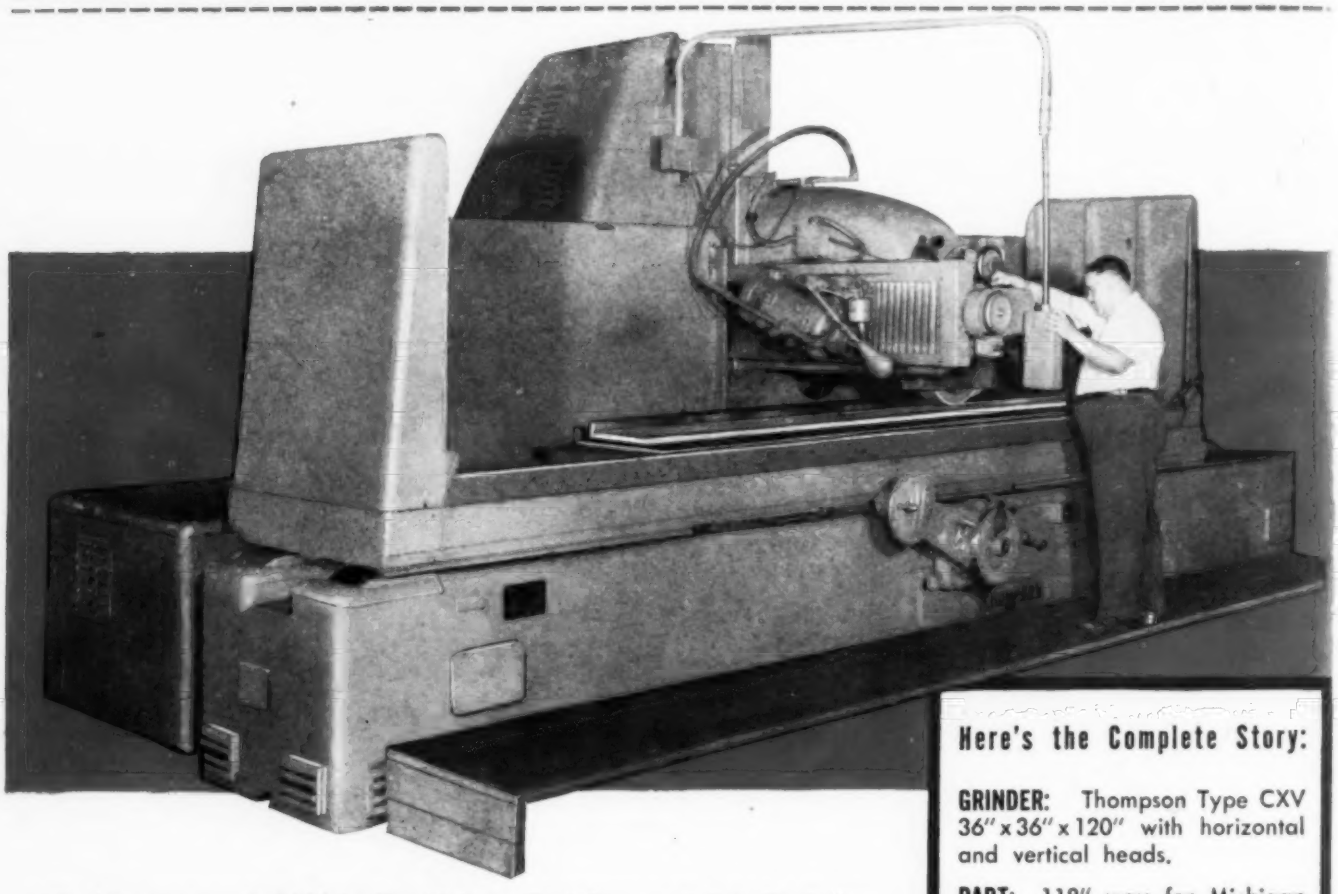
At the same time that we project all these new features we will ever be mindful of maintaining the high editorial standards which were established when this publication was launched in 1955, nor will we ever lose sight of one important goal: To do our part in advancing the art and science of grinding, to expound its applications and help you to do a better job of metal removing with the aid of abrasives.

Wm. F. Schleicher

William F. Schleicher
Editorial Director

When large parts must be ground to total tolerances of .0005" or less . . . .

THOMPSON GRINDERS WITH THE NEW HYDRA-COOL HYDRAULIC SYSTEM SOLVE THE PROBLEM!



Machine ways up to 118" for The Michigan Tool Company's Roto-Flo Spline Rollers must be ground to .0005" total tolerance. Heat distortion, caused by hydraulic heat, became a critical problem in achieving this tolerance.

During the three months of operation since the installation of Thompson's new Hydra-Cool Hydraulic System*, these long ways are being ground to consistent .0003"-.0004" total tolerances. Heat distortion is eliminated. Scrap loss is reduced to zero. Grinding time is greatly reduced.

THOMPSON GRINDERS WITH THE NEW HYDRA-COOL HYDRAULIC SYSTEM MAY BE THE ECONOMICAL SOLUTION TO YOUR GRINDING PROBLEM. WRITE TODAY FOR FULL PARTICULARS.

Hydra-Cool also offers you these exclusive advantages:

- Heat damage to hydraulic seals, valves, controls and pump is eliminated.
- Break down of additive-type hydraulic oils is prevented—sludge will not form in the Hydra-Cool System.
- Lengthy warm-up periods are eliminated.
- Power costs are greatly reduced.

Hydra-Cool is standard on all Thompson surface grinders 40 inches and up in work length AT NO EXTRA COST.

Here's the Complete Story:

GRINDER: Thompson Type CXV 36" x 36" x 120" with horizontal and vertical heads.

PART: 118" way for Michigan Tool Co. Roto-Flo Spline Roller.

RATE OF TABLE TRAVEL: 100 ft./Min.

MATERIAL REMOVED: .065".

METAL: Flame hardened Ductile Iron.

WHEEL: 20x4x12 H Grade.

SCRAP LOSS: None.

GRINDING TIME: 3-4 hrs.

Thompson SURFACE GRINDERS

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Grinding and Finishing
OCTOBER 1957

How Ford Aircraft

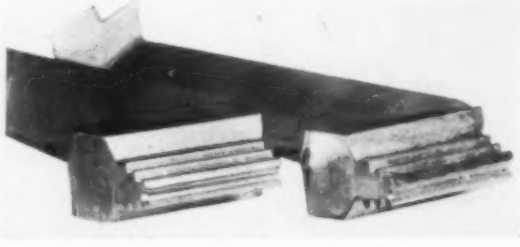
Saves Money on Deburring Operations

by Using Barrel Finishing

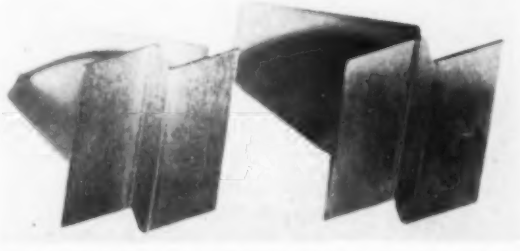
by **Herbert Chase,** M.E.

Buckets are held in chucks rotated on vertical spindles while being advanced through chips and compound in a tub that also rotates. Other components are processed in horizontal barrels having special fixtures or separate compartments to avoid impingements.

1. TURBINE BLADE or bucket as it appears before, (top), and after burr removal, (bottom).



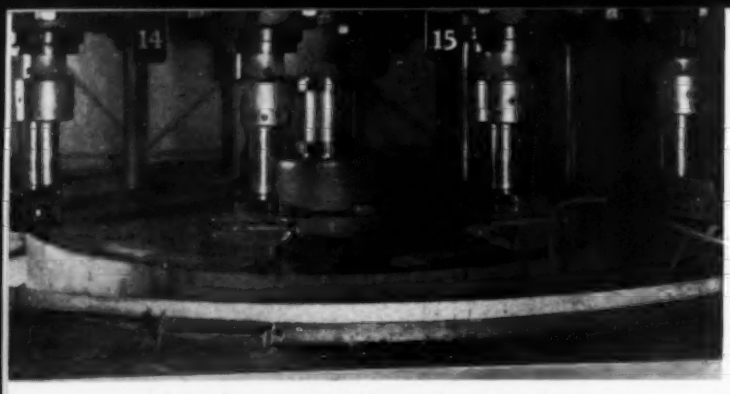
2. ROOT ENDS of two turbine buckets as they appear before, left, and after deburring, slightly rounding all edges and substantially eliminating broaching tool marks.



3. ROOT ENDS of two shrouds, before and after burr removal and scouring of all surfaces.

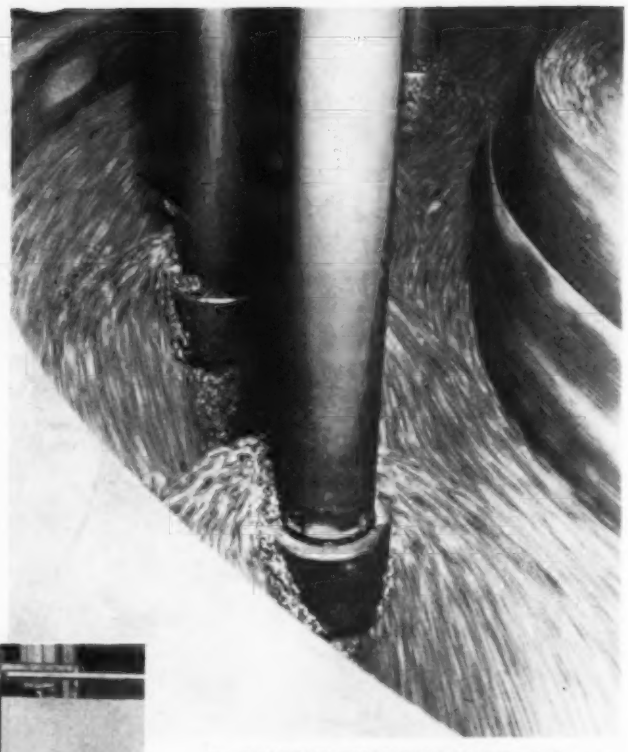
● Important advances and economies in the deburring of numerous parts for turbine type aircraft engines have been attained by the Ford Motor Company at its Chicago plant. Formerly, these components were deburred by hand tools or on abrasive belts or wheels with the work pieces guided by hand. Such work required much skilled labor and commonly lacked the degree of uniformity desired. Such labor as is required is confined largely to loading and unloading the parts and to occasional changes in the abrasive media, plus whatever flushing away of the refuse solutions is needed.

Although considerable equipment is employed for these operations which are performed in synthetic rubber lined barrels that rotate slowly about horizontal axes, much of this processing involves either special steel fixtures that hold the work pieces securely or of multiple compartments each of which holds only one piece. Such arrangements avoid impingements of one part against another and accordingly prevent possible nicking. This is of special importance in parts of fairly large size as, with them, impingements can be serious.

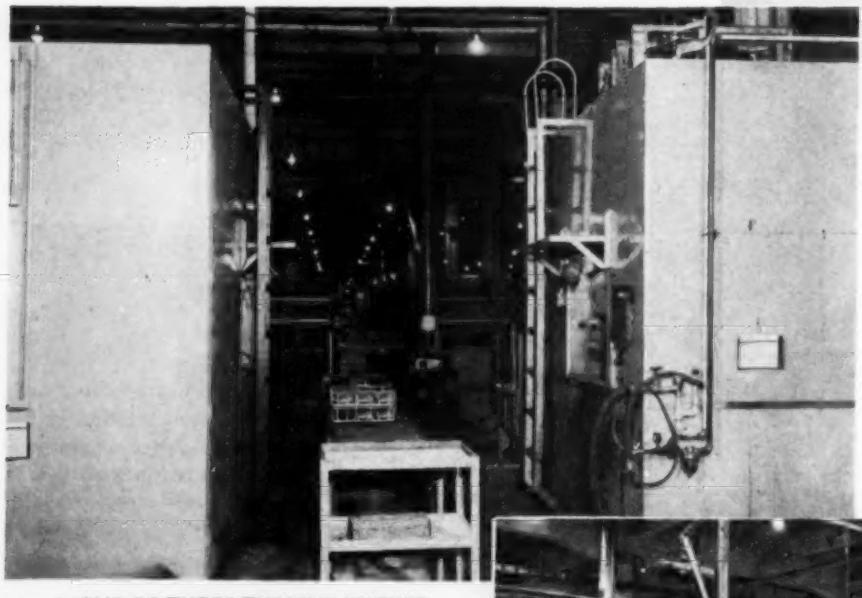


4. SIXTEEN-SPINDLE MACHINE showing fixtures in the foreground elevated and holding turbine buckets clamped, with root ends out, in fixtures. When lowered, the fixtures rotate on their own axis and also are traversed horizontally in an annular path below the level of an abrasive mixture.

Deburring at Ford Aircraft

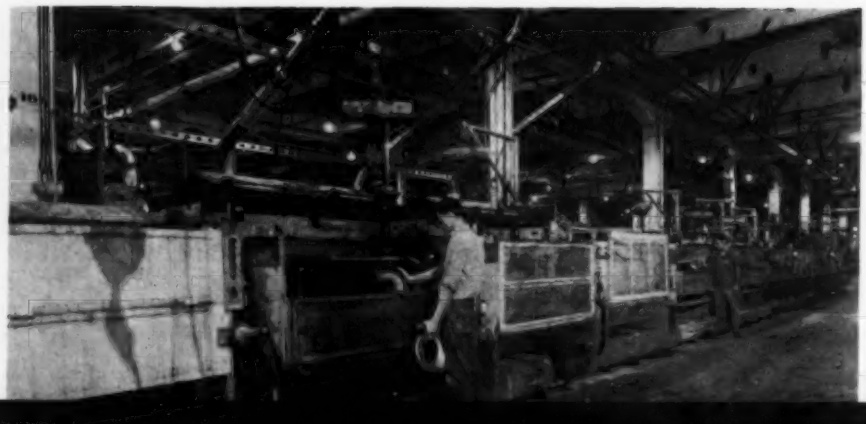


5. CLOSEUP SHOWING PART of the annular tub of a machine and several of the vertical spindles whose fixtures carry turbine buckets through a wet abrasive chip mass that removes burrs from edges and rounds the edges slightly in a 7½ minute cycle, or one finished part each 30 seconds.



6. ONE OF THREE TURBINE BUCKET production lines. At each side is one of the barrel finishing machines enclosed in a housing. Loading and unloading of buckets are done at openings adjacent to the ladders.

7. A HOIST BUCKET loading chips into a barrel of one dual-action machine. In the second machine (No. 28 with safety gate up) a similar barrel is rotating.



8. Another row of barrels in two of which operators are loading rings and gears, one to a compartment. Separators between compartments prevent impingement of work pieces against each other.

It is significant that a very important class of parts, namely turbine buckets (or blades) and shrouds, figures 1, 2 and 3, are deburred in a relatively new type of machine, called "Roto-Matics"; see figures 4, 5 and 6. In these machines, the work pieces are air clamped in fixtures each of which is attached to the lower end of a vertical spindle of which there are sixteen per machine. Each of these spindles rotates at 5 rpm about its own vertical axis except when the spindles are elevated automatically for unloading and reloading of fixtures.

All spindles of each Roto-Matic are supported by a carrier that itself is rotated about a fixed vertical axis at the center of the machine, hence the spindles, their fixtures and the parts held in the fixtures are not only rotated themselves but are carried simultaneously around an annular path. As the fixtures hold work pieces with centerlines offset from the spindle axes, the work pieces, besides being given the compound rotation described, also follow eccentric orbits when the spindles are lowered.

While in lowered position, the work pieces are submerged about 5 in. below the surface of an abrasive mixture, as shown in figure 4. This mixture is contained in an annular tub which also is rotated at 20 rpm about the vertical axis of the machine in a direction opposite to that of the spindle carrier. Accordingly, the abrasive mixture moves, in constantly varying direction, over the edges to be deburred as well as over surfaces between these edges. This motion not only removes burrs but also scours the surfaces and, in so doing, removes the tool marks.

Contents of the tub include 1,500 lb. of No. 6 Grinding chips, 1,500 lb. of No. 7 Coruloy chips, 1,000 lb. of No. 5 Coruloy chips and a specified quantity of No. 525R Roto-Finish Compound plus water that is held about 1 in. below chip level. Both the water and compound are constantly circulated, some overflowing through holes about 1 in. below the top of the abrasive mixture. This overflow returns to a tank from which the water and compound are pumped back to the tub as needed.

Costs, using this equipment are 60 to 70% lower than using hand deburring or other process . . .

In the compound, there are chemicals whose function is to maintain constant cutting action, partly by preventing the chips from becoming glazed. Water keeps the chips cool and wet and is added as needed to make up for evaporation. Compound is added at the rate of one lb. each three hours of operation and new chips in proper proportion are added about once a week as needed to hold the desired level. On the initial charge, compound was added to the load of chips. Chips remain in the tub and so are handled only when placed in the tub.

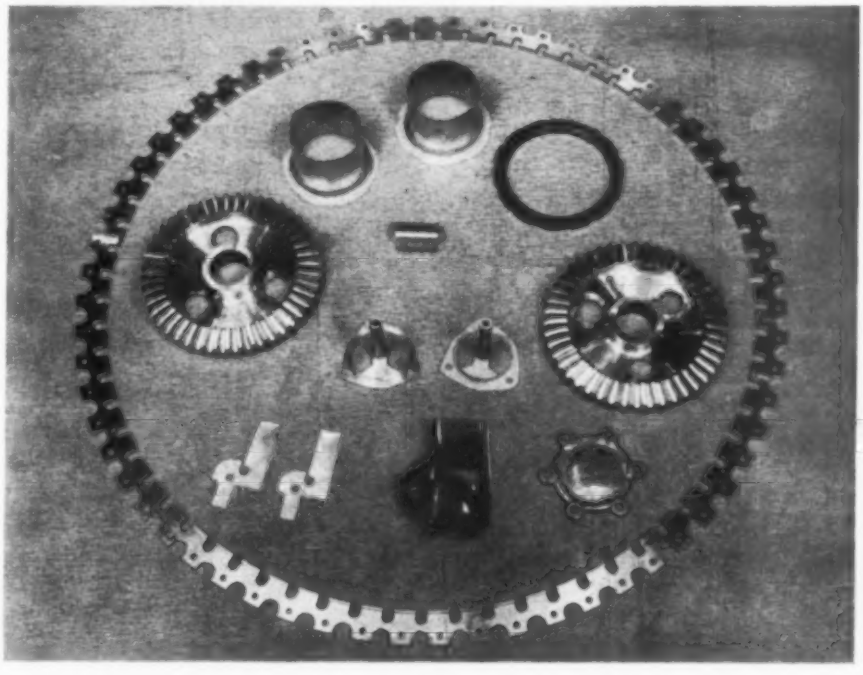
Coruloy chips, supplied by Roto-Finish Co., are aluminum oxide, constituting a synthetic abrasive that produces a more rapid cutting action than grinding chips. But Coruloy chips are subject to more rapid wear than the grinding chips. Experiment has proved that this mixture produces a rapid cutting action and yields the required results in a relatively short time.

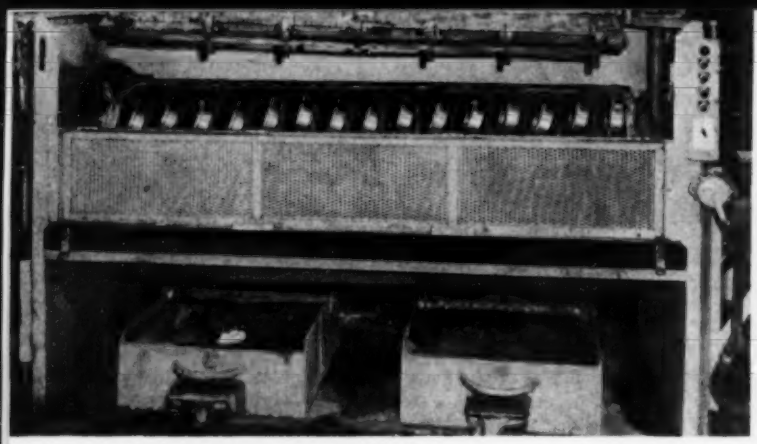
In general, about two blades or shrouds a minute can be processed on the exposed end. Naturally, surfaces that are within the fixtures are protected, however, deburring of both ends is completed in the one operation.

There is one machine in each production line. Deburring results, of course, in a desirable rounding of edges. On the root end, the radii are held between 0.005-in. and 0.015-in. On the other end, the maximum radius permitted is 0.005-in. These limits are readily held.

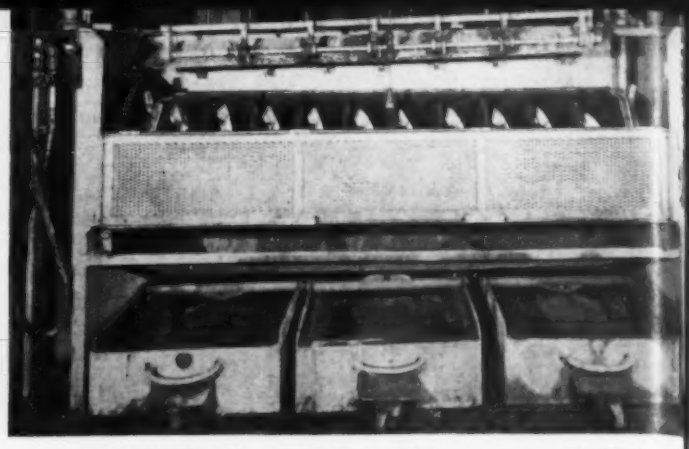
Work pieces come to the machines directly from broaches. Fixtures are split and are hardened

9. GROUP OF TYPICAL AIRCRAFT turbine parts from which burrs are removed, edges are rounded and surfaces are scoured in barrels. Parts appearing in pairs are shown before and after processing.





10. ONE OF THE BARRELS that is 16-in. in diameter, 75-in. long and has 15 separate compartments, each holding one piece along with a charge of abrasive chips, compound and water. A hoist suspends a cover for all compartments.



11. THIS TEN-COMPARTMENT BARREL, measuring 16x75-in., has just been loaded with one piece per compartment. After processing, the work pieces are removed by hand. If chips in compartments are to be changed, they are dumped into hoist pans below the barrel.

Deburring at Ford Aircraft

Meehanite castings. As the fixtures are submerged in the abrasive mixture during deburring, they are subject to some wear but they have not required replacement in more than a year of use.

Although the buckets and shrouds are of hard and very tough alloy metal, they are adequately deburred and scoured in one cycle through the machine. This cycle requires about 7½ minutes plus ½ minute to load and unload. Consequently, in 8 minutes, sixteen fixtures are loaded, pass through the mixture and are unloaded. Just before unloading, each fixture is automatically elevated, ceases to rotate and is unlocked as the parts are removed.

During unloading, recirculated water is discharged automatically through the fixture to wash abrasive particles out of the fixture and make it ready for reloading, which is done at once. Air clamping follows automatically before the fixture is lowered into the mixture. Although spindles stop rotation on their own axes while elevated, they continue their slow annular motion, but it too can be stopped if desired. Annular motion is so slow, however, that the operator has ample time to do loading and unloading during the half min. that each fixture remains elevated.

So good is the job of deburring and scouring that no subsequent belt or wheel work for these purposes is needed and the resultant saving in labor per piece approximates 25 cents. As each piece receives precisely the same treatment in passing through one cycle and nothing save loading and unloading depend upon the operator, uniformity is bound to be attained, provided, of course, that the parts reach the machines in uniform condition.

Chips remain in the tubs constantly but some new chips have to be added, usually about once a week, to hold chip level substantially constant. An almost negligible amount of labor is required to keep the chip mass in desired condition and ready for use.

Roto-Finish deburring, as distinct from the work done on the Roto-Matics, is performed in horizontal barrels, many of which appear in figures 7 and 8. Each such barrel is loaded with a mixture of chips, compound and water, part of this change being in the barrel, as a rule, before the parts to be deburred are placed in the barrels. Chips are loaded from pans that are handled by an overhead electric hoist on a light crane rail, as shown in figure 7. Compound is added by hand and water is fed in by a hose at each barrel.

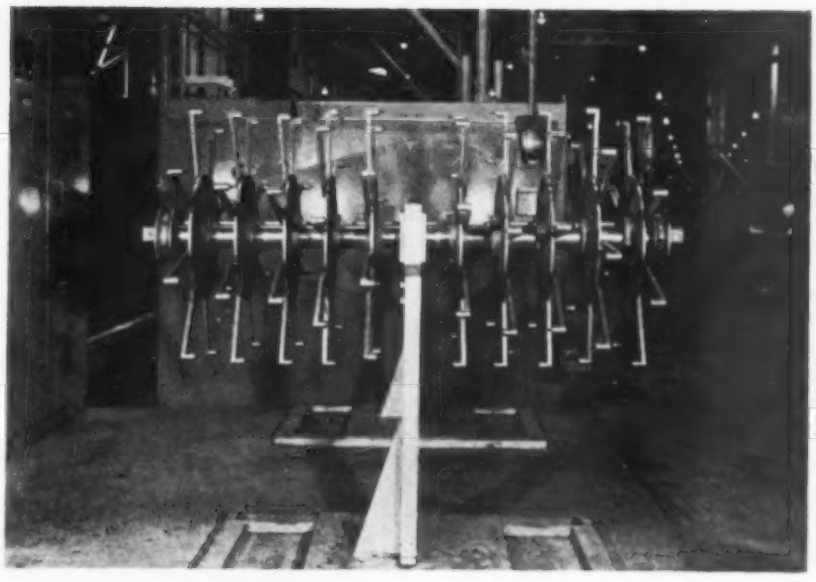
After barrels are loaded, covers are put in place and are locked, after which safety gates are raised. Barrel rotation then begins and continues at a specified rate and for a given time. These depend upon the type and condition of the parts to be processed. In some cases, the direction of rotation is changed at intervals during a given cycle.

Parts deburred in these barrels vary greatly in size and weight as well as in the materials from which they are made. Figure 9 shows an assortment of such parts, including four pairs of duplicates, as the parts appear before and after deburring. As the nature, hardness and type of material differ greatly, the specifications for deburring are varied accordingly.

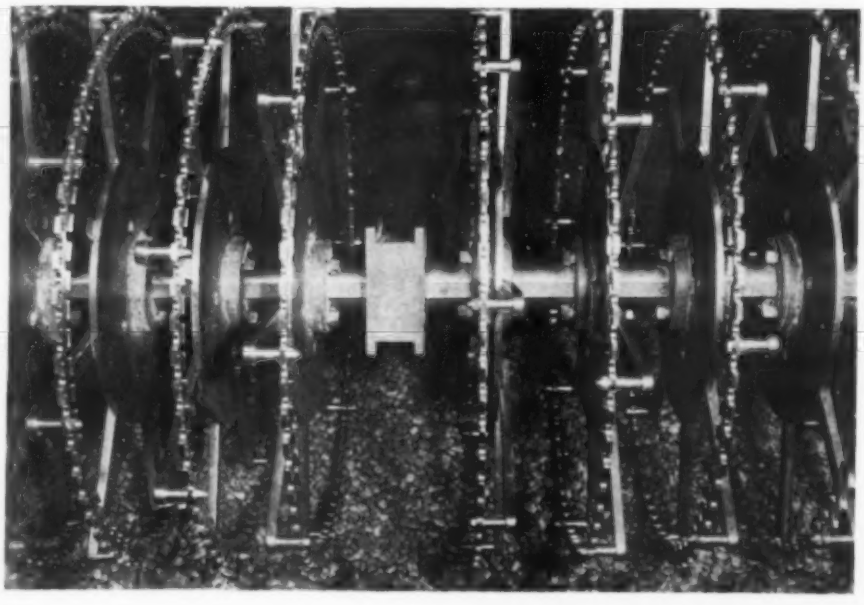
Processing must be such that nicks will not be caused by impingements, that is by one part striking against another in the barrel. In general, parts that are small and light are not nicked by impingements, hence such parts can be mixed with chip masses and handled in bulk. Larger parts that would be nicked by impingements against each other have to be so handled that impingements cannot occur. This is done either by using fixtures that keep the parts separated or by processing only one part per barrel compartment.

Both of these methods are used and many of the barrels, such as those in figures 10 and 11, have multiple compartments. In these barrels, one part for each compartment is deburred but the total number per cycle equals the number of compartments. Each compartment is provided with the same specified load of chips, compound and water.

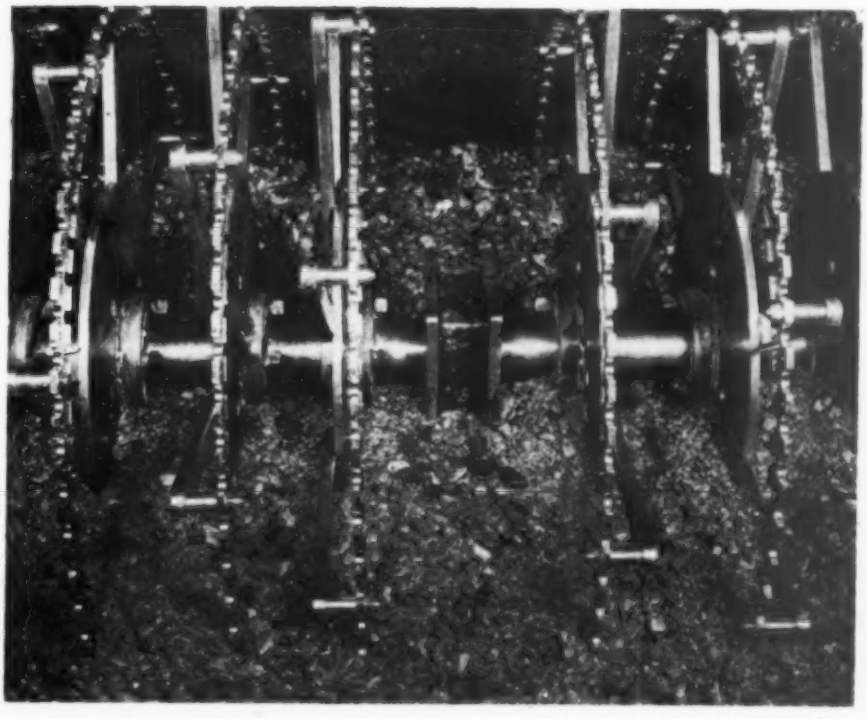
Fixtures are of two general types. One type merely holds the part in fixed position relative to the barrel while, through rotation of the barrel, the chip mass is made to flow over edges to be deburred. In the dual-action type, however, fixtures, such as those in figure 12, are mounted on a shaft that is set in



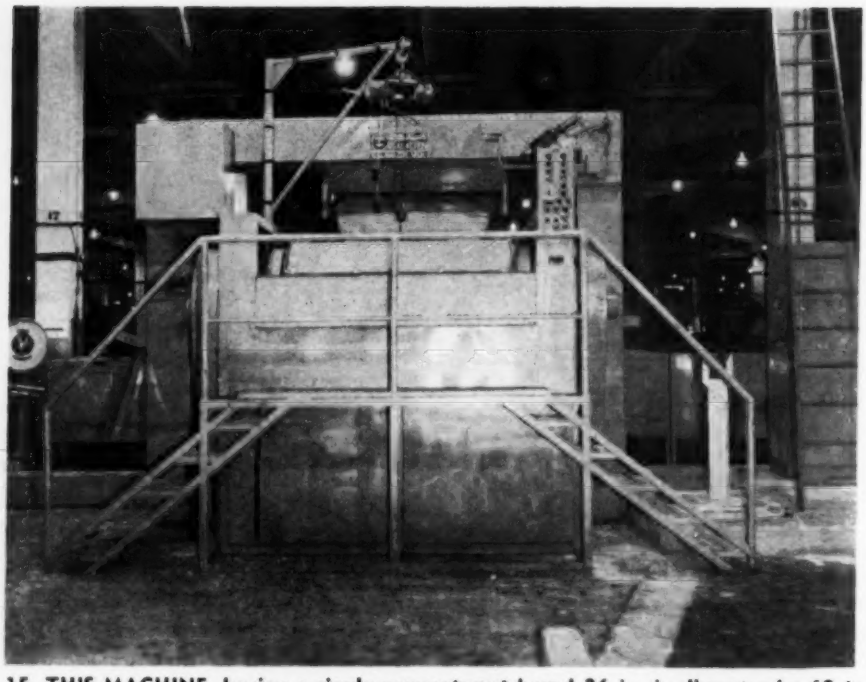
12. TEN NOZZLED DUCT SPACER RINGS of stainless steel are bolted to the spiders of this fixture. Then the assembly, shaft included, is loaded into a dual-action barrel that turns in one direction while the fixtures and work pieces are turned in the opposite direction.



13. LOADED FIXTURE that holds ten notched stainless steel rings as it appears after placing it in a dual-action barrel only partly loaded with stones for deburring all edges and scouring surfaces.



14. SAME FIXTURE shown in figure 13 but with a full charge of abrasive chips in place. After adding water to a level of 2 in. below the shaft and replacing the cover, the barrel is rotated in one direction and the fixture and parts in the opposite direction.



15. THIS MACHINE, having a single-compartment barrel 36 in. in diameter by 68 in. long, includes a conveyor for loading and unloading abrasive chips whose total weight exceeds 3,000 lb.

Deburring at Ford Aircraft

the axis of the barrel and rests in bearings. Ends of the shaft extend through the ends of the barrel and the shaft is driven so that it rotates in a direction opposite to that of the barrel.

Figures 13 and 14 show a set of fixtures and their shaft in a barrel with toothed rings to be deburred bolted to the fixtures. Deburring is more rapid in the dual-action set-up than when fixtures remain fixed in the barrel, but both types operate well. As fixture loading takes considerable time, duplicate sets that remain on their shafts are used so that one set, placed on a stand, as in figure 12, can be unloaded and reloaded while parts in another set are being processed in a barrel.

When processing is finished, the set and shaft are removed and another set, already loaded into fixtures, is put into the barrel. This keeps the dual-action barrels running most of the time, hence fewer barrels are needed.

Some large barrels, such as one dual-action type having a single compartment 36 in. in dia. and 68 in. long, figure 15, have a special conveyor for unloading and reloading chips, as the chip mass is large. It is not necessary in most cases to remove all chips from a barrel unless the next batch to be processed requires a chip change or unless, when parts are not on fixtures and are processed in bulk, dumping is required for separation of chips from parts.

In many cases, part of the chips or all of them remain in the barrel while large parts are taken out and others are inserted. Old compound usually is flushed out and new compound is added when batches are put in place. Barrels are equipped with variable speed drive and the speed chosen usually is the fastest feasible for the particular parts being run. This speed, however, is never high enough to cause chips or parts to be thrown or tossed about but rather to produce a flowing action of chips and solution sufficient to scour edges and surfaces. All barrels have interior coating of Neoprene (synthetic rubber) ½ in. thick.

For the setups in figures 13 and 14, the barrel is turned at 6 rpm in one direction and the fixtured parts at the same speed in the opposite direction. After 10 minutes the directions of rotation are reversed. Parts processed are stainless steel nozzle duct spacers 40 in. in dia. Besides the ten rings, the charge includes 800 lbs. of 4-B and 700 lb. of No. 7 Grinding granite chips, 800 lb. of No. 4 and 700 lb. of No. 7 Coruloy chips, 10 lb. of No. 355 Roto-Finish compound and enough water to bring it 2 in. below the shaft.

Aluminum alloy and magnesium alloy parts are deburred in barrels of 40 or 42 in. dia. using a chip mass the same as that in the barrel, figures 13 and 14, but the compound used is Roto-Finish No. 203 and, as the parts processed are relatively soft, deburring time is only 1 hr.

Stainless steel parts such as the gear, figure 9, and several other parts are processed in barrels with individual compartments, figures 10 and 11, that are 16 in. in dia. and rotate at 16 rpm, time being about 5 hr. A mixture of Roto-Finish No. 4-B and No. 6 Grinding granite chips is used along with No. 355 Roto-Finish compound. In some work, the primary objective is to round off sharp edges or to improve surface finish, although deburring also results.

Processing time occasionally is as short as 30 min. but more often ranges from 3 to 5 hr., especially for stainless steel. Time depends upon many factors such as material and condition of parts, their size and shape; size, nature and weight of chips; size of barrel and speed of rotation; fixturing of parts, amount of material to be removed by processing, degree of smoothness required and other circumstances. Experience has shown what is needed for given parts in average condition and records have been made and are followed so that required results can be attained in repeat runs.

In general, the work done as outlined above has resulted in costs from 60 to 70 per cent lower than for hand deburring or other prior processing. Besides this, quality is improved, uniformity is attained and dependence upon the skill and judgment of operators using hand methods is avoided, with some savings in scrap and rework. These benefits are substantial and have amply justified investments in equipment, as they are amortized quickly out of savings attained.

• • •

Safety precaution

Shot Peening Strengthens Jet Blades

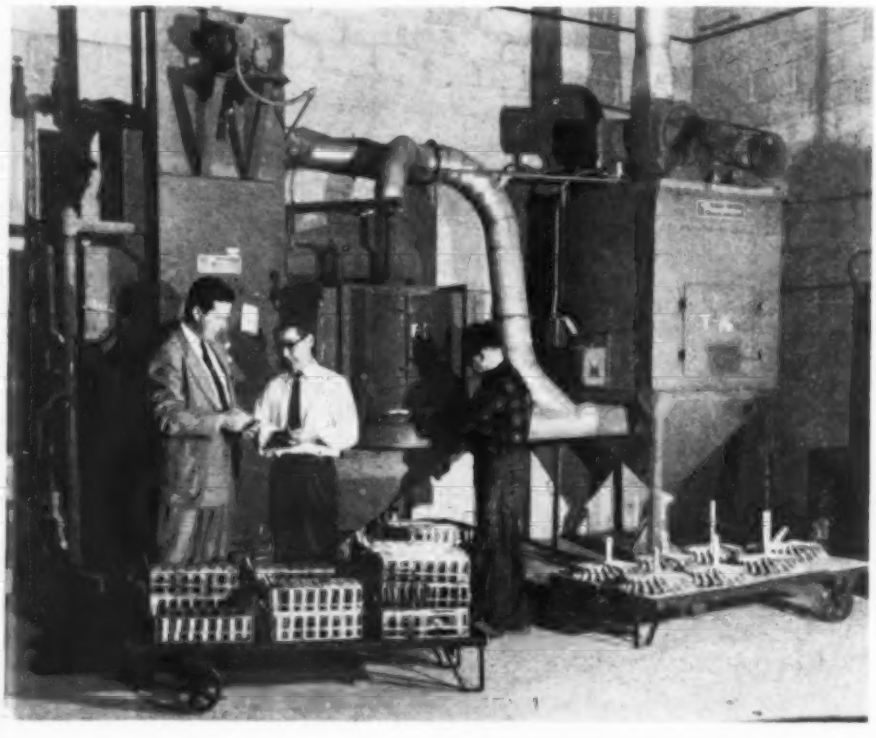
ENGINEERS POINT OUT contact area of high speed turbine blades which are blasted by high-intensity blast nozzles for greater strength.

• Defective turbine blades have no place at the hot end of a jet engine operating at speeds of 7,500 rpm with hot gases passing through the vanes at 900 to 1000 miles per hour. In jet components manufactured by the Fairchild Engine Division of Fairchild Corporation, Deer Park, N.Y., shot peening is a safety precaution performed on parts which receive the greater stress and wear. The jet turbine vanes are made of special high temperature cobalt steel alloy forgings. Grooves are ground-in for proper alignment on the turbine wheel. These grooves are the area of contact with the turbine wheel and are subjected to the greatest amount of operating stress. The grooved root forms of these vanes receive the shot peening action on a special airblast table designed for selective peening.

The airblast table, manufactured by the Pangborn Corporation, is equipped with a flexible rubber ring that masks the blade portion of the vane. The special rotating work fixture is equipped to handle 36 individual units and can process 600 turbine vanes per hour. Four high intensity airblast nozzles are positioned in the blasting unit so that the vane is hit by the abrasive stream from all directions.

Jet turbine wheels and impellers, also subjected to severe high speed operating conditions, receive a shot peening treatment to reduce the possibility of failure.

• • •



FREQUENT CHECKS of peening intensity and shot separation performed by the machine's separator unit assure proper peening of the vanes. Shot peening is also used to increase the life of one-piece aluminum impellers at right.

2 approaches

Diaphragm Chucking Speeds

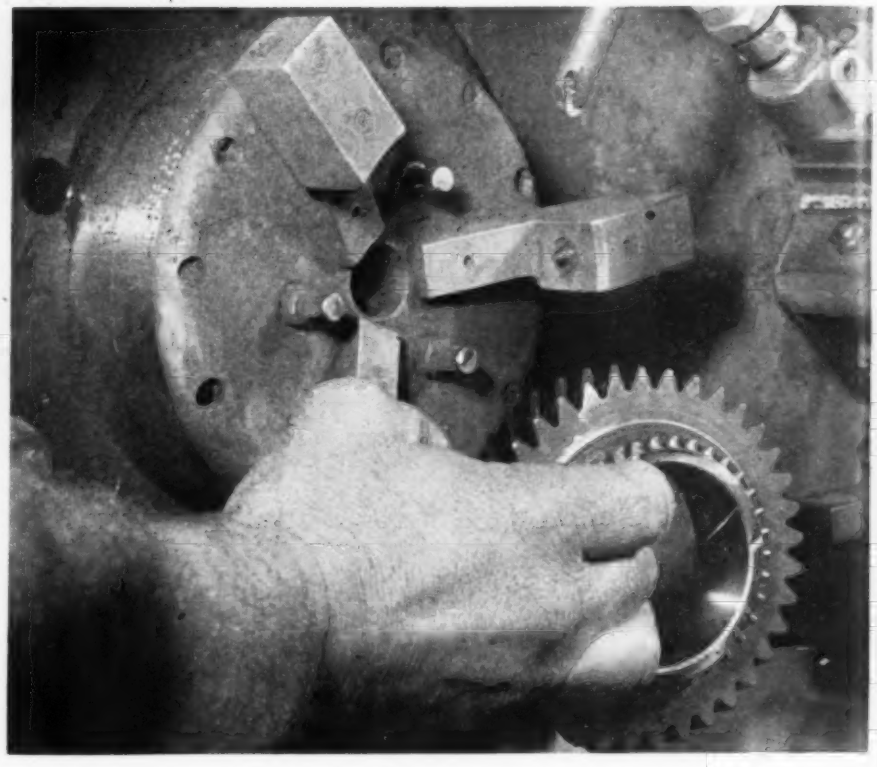
• Two examples of how to chuck external gears on the pitch line for short and medium run production came to our attention during two visits to plants faced with this problem. Both were using variations of diaphragm chucks mounted on Heald Internal Grinding Machines. Production quantities differed and each plant approached their problem of chucking in a different manner.

The diaphragm chucks were manufactured by the N. A. Woodworth Co. of Detroit, Michigan. The basic design operates on the very simple principle—the flexing of a bell-shaped member, much in a manner similar to the flexing of an oil can bottom as you squirt oil from the can. Since there are no sliding parts and no friction or wear connected with opening and closing the chuck jaws, which are attached to the flexing member or diaphragm, the adoption of this design for chucking external gears immediately showed possibilities.

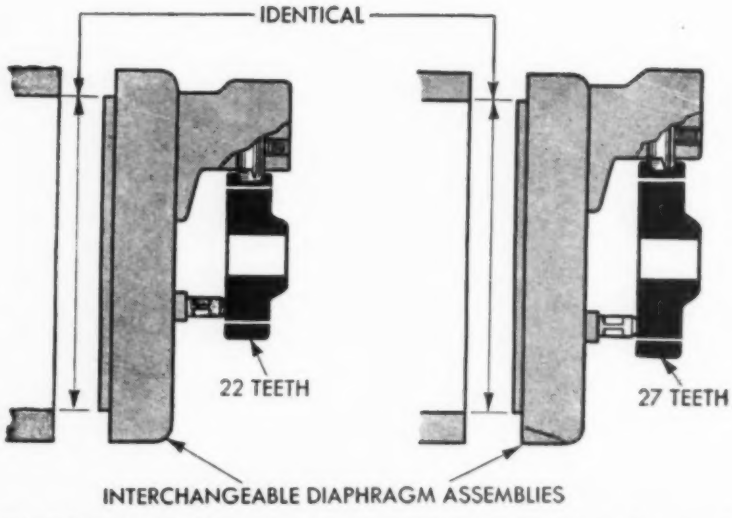
In operation, the external chuck has an air-operated piston or a mechanical pushrod which flexes the diaphragm. The chuck jaws are attached to the diaphragm so that when the diaphragm is pushed outward, in the direction of the jaws, the jaws open enough to permit the workpiece to be inserted against positive stops. Releasing the diaphragm causes the jaws to spring back, firmly gripping the workpiece.

Concentricity of the chuck and the chuck jaws can be attained and maintained without much difficulty since the chuck jaws can be ground on the machine after the chuck has been mounted and adjusted.

The diaphragm chucking principle applied to gear chucking produces very accurate results. A hardened



1 Replaceable diaphragm-and-jaw assembly for each gear type

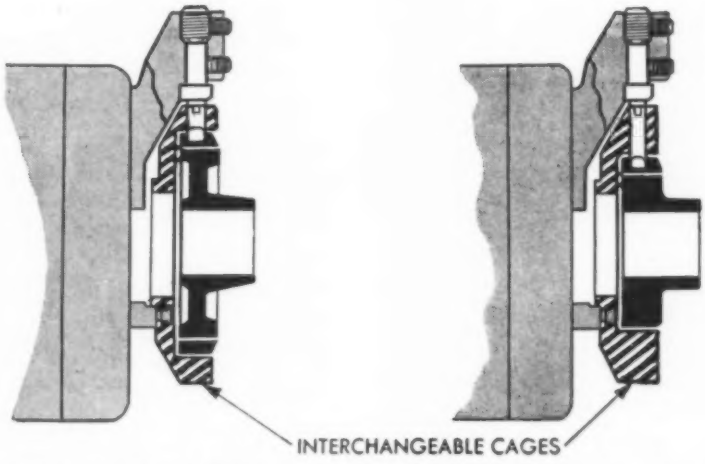


DIAPHRAGM CHUCKS can be economically applied to short and medium runs by using interchangeable diaphragm assemblies.

By **Jack Kenyon**
Managing Editor

ed Short Run Gear Production

2 Fixed diaphragm—replaceable gear "cages" on basic assembly



THE DIAPHRAGM ASSEMBLY is not removed in changing the setup. The cage carrying the gear jaws is interchanged by removing 3 screws. The OD of the gear locating pins remains constant so that no adjustment of the master jaws is necessary. Each cage is designed to suit the tooth spacing and pitch diameter of one gear.

gear, considerably distorted, can be chucked on the pitch diameter and the ID can be ground concentric with the pitch diameter within .001" TIR.

The two different approaches to the problem of chucking the pitch diameters of external gears varied with the type of the chuck jaws and how they were mounted on the Woodworth diaphragm chucks.

One method utilizes a replaceable diaphragm-and-jaw assembly with integral locating pin jaws for each gear to be ground. To insure interchangeability of diaphragms the pilot diameters for the assembly of the chuck have to be held to close tolerances. In order to change from a 22-tooth gear to a 27-tooth gear of a different pitch diameter, the mounting screws are removed from the diaphragm assembly and the whole assembly is replaced.

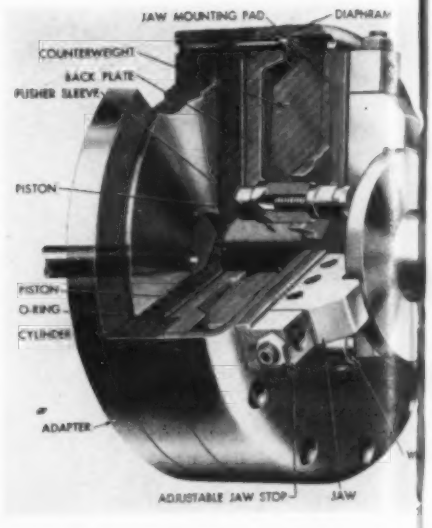
Another method to provide quick interchangeability, and one which is very economical, is to use replaceable gear "cages" in conjunction with a standard fixed diaphragm. In this application, the diaphragm is not removed from the machine. The cage carrying the gear jaws is interchanged by removing three screws. The OD of the gear pins remains constant so that no adjustment of the master jaws on the diaphragm itself is necessary. Each cage is designed for the tooth spacing and pitch diameter of one gear. Setup time for the cage often does not exceed five minutes.

What factors influenced the choice of different chucking methods on similar applications? One approach was for medium run production and the other for short run production.

In the hard grind department of the Ford Tractor plant which finish grinds the ID's of transmission

APPLICATION NO. 1

Ford Tractor's production of nine different transmission gears ranges between 180-550



GRIPPING POWER OF a diaphragm chuck is furnished by flexing of the diaphragm along the main axis of the chuck.

gears, six Heald 271 Sizematic internal grinders equipped with Woodworth diaphragm chucks handle nine different transmission gears of varying pitch diameters and number of teeth, in production quantities that range from about 180 gears to 550 gears between changeovers. (The 180 figure represents the normal production in eight hours running on one machine.)

As in many "hard grind" lines, this department is faced with variations other than normally expected in production, having to absorb the slight but bothersome errors in machining and heat treat distortion that can occur to a gear when it is being processed.

TRANSMISSION GEARS ranging between about nine inches to 4 inches pitch diameter are finish ground on six Heald 271's in the Ford tractor plant. Concentricity required is .002-inch TIR between pitch diameter and ID.

At least six different parts are being run in the department at the same time—one on each of the Healds. Variations in the parts which are normally found are heat treat shrinkage and growth, and pitch diameter variations are taken care of in the diaphragm chucking equipment by adjusting the locating pins on the chuck.

The chucks in the Ford plant installation are air-operated, using 70 psi air. To give complete flexibility in scheduling parts through the department, all diaphragms in use will fit any of the department's machines. The diaphragm itself is attached to the chuck body by 12 socket-head screws.

Complete changeover from one diaphragm to another, ready to run, takes from 45 minutes to an hour, including indicating the assembly and running trial parts.

The nine transmission gears handled by the internal grinding department range in size from

SIX HEALD 271 SIZEMATIC grinders in this line at the Ford Motor Company tractor plant finish grind the bores and faces of nine different tractor transmission gears in lots ranging from 180 to 550 parts.

APPLICATION NO. 2

Chelsea Products Company uses 25 cages for 93 types of gears on short run production

about 4 inches to about 8-¾ inches pitch diameter. Typical gears of the series are SAE 5140 steel forgings, hardened on the ground surfaces to Rockwell 15N-87.9 minimum to a case depth of .005". Squareness of the gear face to the bore is held within .002" TIR, with .001" limits on size of the finished bore. Concentricity between bore and the pitch diameter of the gear is held within .004" TIR. From .010" to .015" of stock is removed from the ID in the finish grinding operation. A 25 microinch finish is typical for the gear bores.

For still shorter length production runs of gears that must be ground on the ID, another adaptation of the diaphragm chuck has proved very useful. Instead of interchanging the whole diaphragm, it is only necessary to replace a "cage" ring on the basic diaphragm assembly. This cuts the cost of the basic tooling necessary for accurate grinding and makes possible easy, fast changing from one gear size and design to another.

The gear chucking cages have been in use for some time in the plant of Chelsea Products Company, Chelsea, Michigan, who manufacture power takeoff units. The length of Chelsea's production runs did not justify interchangeable diaphragms such as those in use at the Ford Tractor plant, and the alternative cages have been entirely satisfactory for their length of run.

A total of 93 different gears must be ground for the various ratio takeoff units manufactured by the company. To handle this range of parts, a clever arrangement involving only 25 different cages is in use. Even the locating and clamping pins in the cages have been made interchangeable so that the 25 cages will handle the entire line of 93 gears.

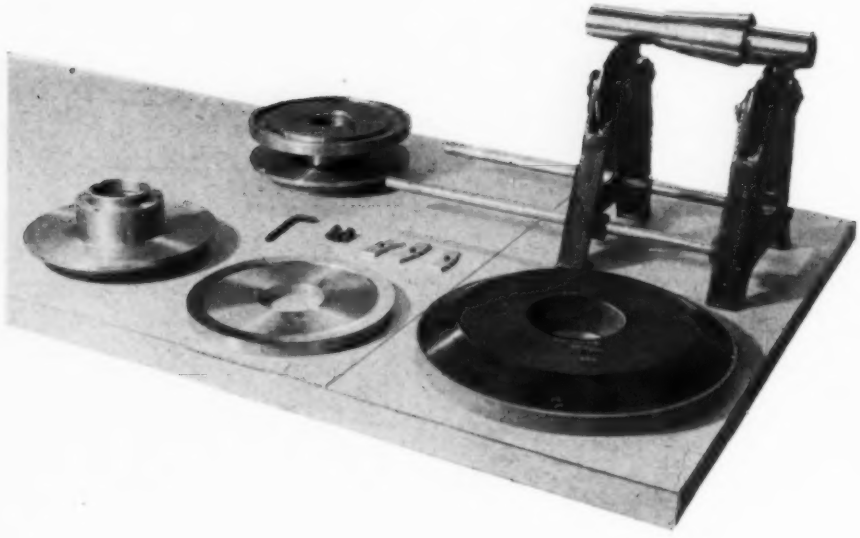
Of the 93 gears ground in the diaphragm chucking equipment, 23 are two-cluster gears with 43° taper ID grind. The remainder are straight hole grinding operations with ID's ranging from ¾ to 1-¼ inch diameters. Largest of the gears in the line has a 4.000" pitch diameter, while the smallest has a 1.7142" PD.

INTERCHANGEABLE CAGES containing the locating and clamping pins for the range of gear sizes and designs ground by Chelsea Products make for fast setups and low tooling costs, more accurate grinding.

NINETY-THREE DIFFERENT GEARS, most of them helical, are handled with a minimum of setup time for ID grinding in the plant of Chelsea Products by the use of interchangeable gear cages with diaphragm type chucks.

To change the cage, adjust the pins, and indicate the part takes only 30 minutes. A complete setup, including grinding sample parts and getting an okay inspection takes a maximum of 1½ hours. The former method used by the company, involving the use of conventional chuck and pins, including pad grinding, took 1¼ hours, with a complete setup with inspection okay taking a maximum of 3 hours.

• • •



1. HERE ARE THE ESSENTIAL PARTS diamond wheel, wheel adapter, and balancing device ready for assembly and checking. Front row from left to right shows adapter, flange, and diamond wheel. Screws, balancing weights and wrench are spread out at center. At rear of view a complete adapter is assembled to the left of the balancing device with spindle in place.

How to Grind Carbide Dies

By **Don E. Oberg**
General Manager
Oberg Mfg. Co., Inc.
Tarentum, Penna.

● A carbide die is a precision tool and it is expensive. You would naturally expect to give it the same consideration you give to any other piece of precision equipment. A good carbide die will produce at least ten times the number of pieces before grinding as a HCHC die of comparable quality. The total number of pieces will run into astronomical figures before the full life of a carbide die expires under good care and treatment.

I would like to draw on our experience in the making and repairing of precision production dies by offering specific recommendations on the care of carbide dies. You can extend their useful life and production efficiency with proper care. In fact, a well-planned maintenance program will contribute to higher production and lower unit cost.

The first consideration is sharpening equipment. You need a machine large enough to carry the heavier weight of a carbide die.

A grinder which mounts a peripheral type (D1T) wheel will make your work easier than one with a vertical spindle mounting a cup (D2W) type wheel. Your visibility on the first is far greater since the area of contact with the D1T type wheel is less.

Whatever the style of grinder, you will not get a good job from it unless the wheel spindle is sturdy and runs true on good bearings (see: Care of Spindles, G & F, September, 1957).

You can protect your die from heat checking damage, and prolong the life of the diamond wheel, if you supply a copious, uninterrupted flow of clean coolant to the face of the wheel at the point of contact.

The coolant will flush ground-off material and will help reduce wheel chatter caused by excessive loading and glazing. Besides that, you will get a better finish on carbide with wet grinding. At the same time, the coolant must be free of sulfur. This element will attack the cobalt binder in the carbide and the resins in the wheel bond.

It is important for you to select the proper wheel.

A resinoid bonded diamond wheel of the proper grit size and hardness, having a bakelite core, has been very efficient in our experience. A special reinforced bakelite core will add greatly to the stability of the wheel.

Green grit wheels should be avoided. They present too many hazards of possible damage to the die.

Metal cored wheels also should be avoided. Localized heat tends to warp the metal core out of round, causing a chattered finish on the carbide. This, in turn, necessitates more frequent dressings and much shorter wheel life.

An ideal combination of wheels would consist of a 100-grit for roughing and a 180-grit for the final .001-in. to .002-in. of cut. But, the use of one 150-grit wheel as an all-purpose wheel has proved successful.

Each of the three choices of wheel is recommended with the

Expect best performance from carbide dies by following two important rules:

1. run it on a good press

2. use proper regrinding practice

same general specifications other than grit size. It would have an R bond hardness, a diamond concentration of 100, a resinoid bond for wet grinding, and an eighth-inch depth of diamond section.

Your grinder should produce approximately 4200 surface-feet-per-minute at the perimeter of the wheel.

The size of grinder required will depend upon the dies being sharpened. This factor will govern your selection of wheel width which may, in very large equipment, run up to 3 inches for best economy.

Table speeds should be approximately 85 FPM for roughing and faster for finishing. Cross feeds of ¼-in. to ⅜-in. are best for roughing. Reducing the cross feed to 1/32-in. will help produce a better finish on the final passes.

Check both the spindle and the wheel adapter with a dial indicator for true running.

Check the flanges for burrs that may affect the proper fit of the wheel. When the wheel is mounted on the adapter, make certain the size of the bore is sufficient to pass the wheel freely up against the shoulder of the adapter.

Diamond wheel manufacturers generally make the bore larger than nominal size to permit adjustment of the outside diameter to a true running position. This is your first step in mounting a wheel.

Place the outer flange of the adapter in position against the wheel and tighten the screws lightly. Check run-out of the wheel on the side and on the grinding surface with a dial indicator. If the flanges are free of burrs and dirt, the wheel should run true when you check the side. If not, check for the cause of trouble before going to the next stop.

Then, check the periphery. Make adjustments by applying a small wood block against the high spot and tap the wood lightly with a hammer.

Finally, check the assembled adapter and wheel for balance, making whatever corrections are necessary in locating the adapter balancing weights. An out-of-balance wheel can cause rough surface finishes and its life will be unnecessarily shortened by too frequent dressing.

From this moment forward, until the wheel is completely worn out, the diamond wheel should never be removed from its adapter.

The price of a separate adapter for each diamond wheel is nothing compared with the set up time involved and the more frequent dressing of a large diamond wheel to make corrections. A good wheel will cost you about $5 per .001-in. of wheel diameter.

A brake-controlled dresser is recommended with a silicon-carbide wheel of 3-in. dia., 1-in. face, and 1/2-in. bore.

Place the dresser at some convenient place on the grinder table or magnetic chuck with its spindle parallel with, and in the same vertical plane as, the spindle of the grinder. The dresser wheel should travel in a straight line with the diamond wheel. Parallelism and alignment are factors leading to economical and efficient dressing.

If the brake-controlled dresser is set properly, it will travel at approximately 1500 SFM when driven by contact with the diamond wheel traveling at normal speed.

Some operators start the dressing wheel spinning with a small wooden stick. You can do this better and safer by adding a small knurled knob to the dresser spindle. In any event, it is important to have the dressing wheel spinning when it first contacts the diamond wheel. If you don't, you will grind a flat on the dressing wheel and damage the diamond wheel as dressing proceeds.

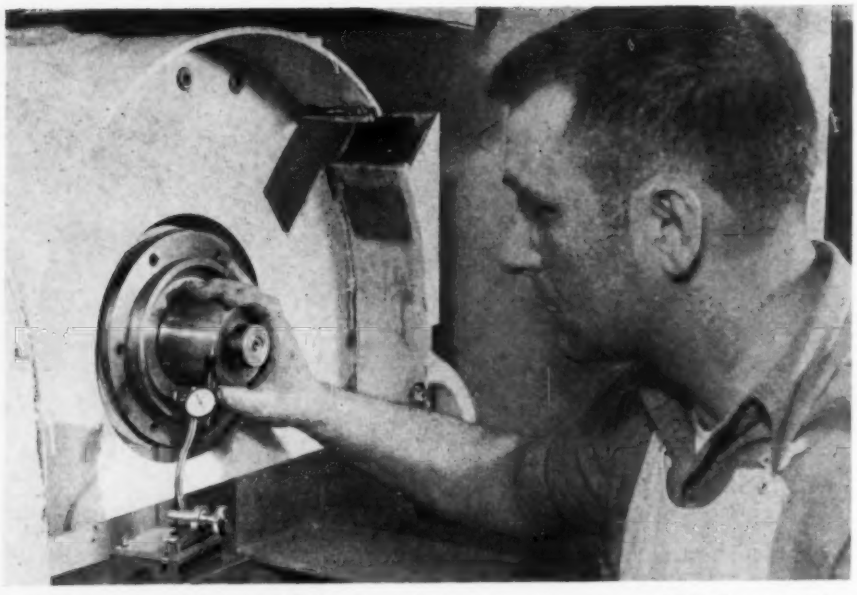
Use cross feed only. Move the diamond wheel over the dressing wheel in line with the grinder spindle. Use no coolant.

Down feed the wheel at about .0005-in. to .001-in. for each pass. After you take a cut of about .005-in. total, stop the diamond wheel and checl. your results. Repeat as necessary to obtain a true and smooth surface.

The color of the diamond wheel will be the same over the entire face when it is dressed true. The purpose is to dress away the wheel bond, make the wheel true, and expose sharp diamond particles to make a clean cut. A sharp, true running wheel gives an excellent finish on the face of punch or die. Follow up with frequent use of the cleaning sticks furnished by wheel manufacturers. This keeps the wheel open and clean cutting.

If you use a large number of diamond wheels in your shop, it might prove profitable to consider a diamond wheel salvage program. I will be glad to give you details of such a program on request.

Clean up all oil, slugs, and



2. THE SPINDLE MUST BE STURDY and should run true on good bearings to get a good job of grinding. Here, operator is first checking spindle for run-out with a dial indicator before mounting the wheel adapter.

3. IN ADDITION to the necessity of a true running spindle, the adapter and grinding wheel assembly must be perfectly balanced before grinding can be done with any degree of precision.

4. OPERATOR MUST ALSO CHECK RUN OUT of diamond wheel when it is mounted on grinding machine after being previously balanced. Run-out on the wheel is of the same importance as run-out on the spindle and is checked in the same manner.

foreign material on a carbide die set before you begin sharpening.

Also, remove set-edges and lifters from the dies and push pins, as well as pilots and other appurtenances from the punch. Inspect the bottom of the shoe and top of the punch holder. Remove any burrs which may prevent the die or punch from being held flat on the grinder chuck.

Check the cutting edges of the punch and die to determine how much material must be removed to produce good clean cutting edges. It may be better to replace sections showing excessive wear or chipping to avoid excessive grinding of the entire surface.

Chuck the die on the grinder.

If your machine has automatic table traverse, set the stops so the wheel will pass at least one inch beyond each end of the die. Set cross index and table speeds as recommended and bring the wheel into contact with the work.

When you are grinding carbide with a diamond wheel you will see no sparks as when you grind steel with an artificial abrasive wheel. Diamonds are beautiful in a piece of jewelry, but on the surface of a grinding wheel their appearance has no aesthetic value. You do not grind by sight. You listen for the tell-tale sound. A light hissing sound tells you the wheel is in contact with the work.

After the first contact, raise the wheel about .002 inch and return it to the cutting position by down-feeding .0002-in. on each pass. Let your roughing cuts take a maximum of .0002-in. Down feed no more than .0001-in. for finish cuts, with several free passes between feeds.

If you let the machine stop at any time, raise the wheel at least .002-in. before it contacts the work again. Then, down feed as before. This is necessary because you must allow for a possible change in elevation of the table from oil accumulating on the bearings during the momentary shut down.

You can establish the total necessary depth of grind by plunging the width of the wheel right through the area requiring the heaviest cut. Make successive passes until you re-

move all signs of wear along that path. Lift the wheel back to the beginning height and proceed cutting by the standard method until a final pass across the whole die removes the first wheel path.

Double check the cutting edges of the tool before you remove it from the grinder. This may save additional handling.

If you are about to grind a total depth of more than .010-in., remove as much of the shoe and die steel material as possible with an aluminum oxide wheel before you use the diamond wheel. Tool steel has a dressing action on the bond and wears down a diamond wheel much faster than carbide. Avoid excessive grinding of steel with diamond wheels.

Grinding the carbide punch is relatively simple since the stripper usually is made to fit with very close tolerances. This permits you to use the stripper as a punch support.

Remove guide pins on one side of the punch assembly, then raise the stripper on the punch to give minimum punch exposure and maximum support.

If the stripper is not guided, use a punched piece from your last run to support slender punches. Be careful about chipping punches as you place the strip on the punches or remove it after grinding.

After grinding, clean up both die and punch thoroughly.

Wash off all sludge, grit, and foreign material of every kind. Give special attention to stripper guide bushings, guide pins, pin bushings, and greasing cavities, as well as punch and die openings. Dry and demagnetize the entire assembly.

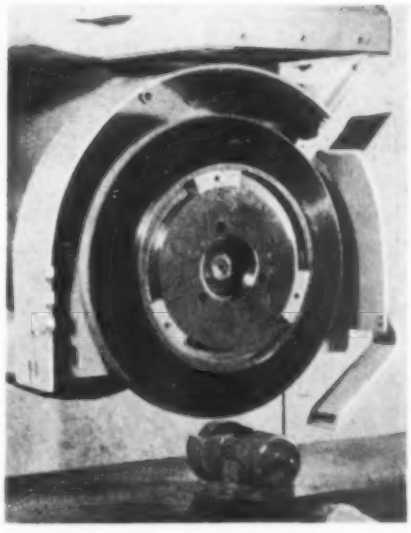
Insert pilots, push pins, and other devices in the punch. Make sure that all back-up screws are in place when you replace the strippers. Draw back the stripper when necessary by placing washers under the head of the stripper bolts. See that the washers under each bolt head are exactly the same total thickness.

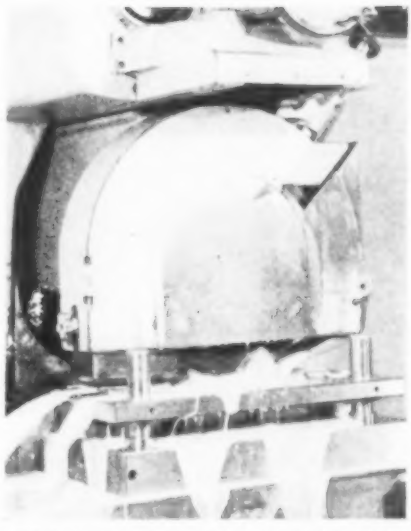
Do not over-compress the stripper springs. Over-compression promotes early spring failure. You can use shorter springs or fewer washers under the springs to give the correct spring pressure and deflection. When the stripper is drawn back, the pilots and push pins must be reground to the correct length.

Replace lifters, set-edges in the die, and apply grease. Lubri-plate No. 130AA or equivalent is recommended. The die then is ready to return to the press.

While these instructions may at first appear to be rather tedious, your strict attention to the details will pay off in cleaner cutting, greater production between grinds, longer die life, and more economical use of diamond wheels. It is well worth the effort. • • •

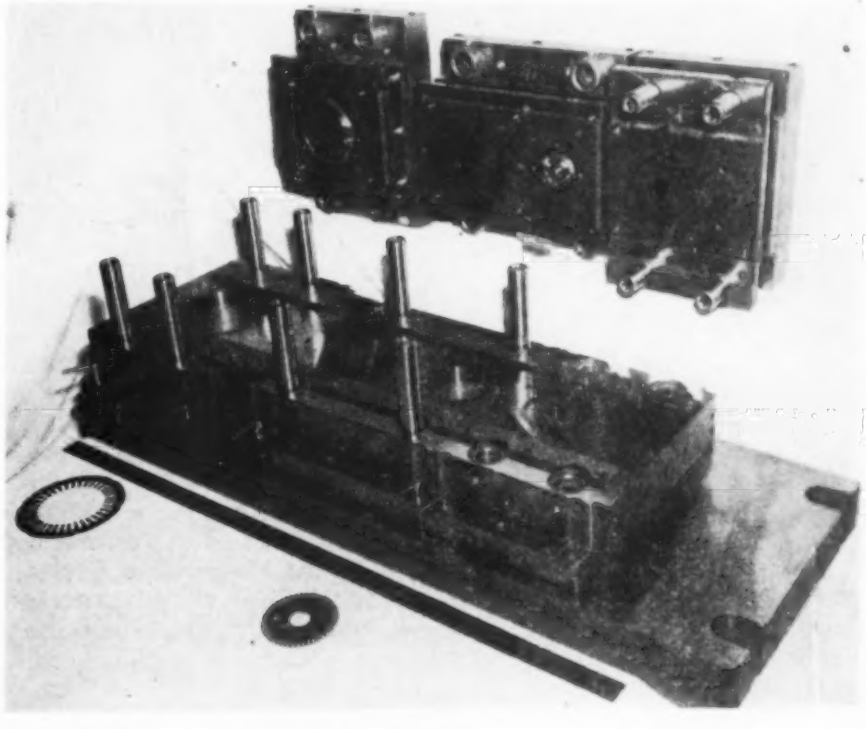
5. OPERATOR DRESSES OUTSIDE DIAMETER of diamond wheel absolutely true and round with a silicon carbide wheel on a brake controlled dresser.





6. YOU CAN PROTECT YOUR DIE from heat checking damage, and prolong the life of the diamond wheel with a copious, uninterrupted flow of clean coolant. Grinding the carbide punch is relatively simple since the stripper is made to fit with very close tolerances and can be used for adequate support when raised near the cutting end of the punch to give maximum support with minimum punch exposure. Only two guide pins remain in punch holder for alignment. Use any two outside pins which will allow clearance of wheel over entire surface area of punch.

7. LARGE PROGRESSIVE CARBIDE DIE SET which produces a 7-⅜" diameter stator and a 4⅜" rotor, illustrating an assembly which requires the utmost of precision handling and maintenance. Proper grinding makes this kind of die set very economical on large production runs.



how to grind thin and small parts

by **Roger N. Perry, Jr.**
Technical Service Section
Norton Company

● Some of the difficult grinding problems aren't problems in grinding at all. The problem may be in holding the work for grinding, or it may be a case of grinding a combination of different materials.

Holding very thin or very small parts for grinding frequently magnifies the problem. For example, how would you grind stainless steel strips .002" thick down to .0005" thick? Surface grind? Lap?

An instrument maker did it by cylindrical grinding between centers! (Figure 1).

At the Atlantic Refining Company laboratory in Dallas, Texas, the strips were wrapped around a precision ground cylinder and clamped in much the same fashion that sandpaper is fastened to the drum of a floor sander. After that, grinding off one and a half thousandths became a conventional operation of grinding between centers. As in all precision work of this kind, center holes were lapped and the machine had to be in first class condition.

Delicate Parts

In the new scientific field of guided missiles, earth satellites and rockets, machining to extremely close limits makes the difference between success and failure. Brookfield Machine Company of West Brookfield, Mass., has faced some unusual problems of this type in doing custom machining for projects being carried on at Massachusetts Institute of Technology.

One such part is a gimbal for an inertial guidance system in a guided missile. The part is made of cast aluminum about four inches long and two inches in diameter. (See Figure 2). Each end is ground to insure a proper fit with an adjoining part. Many of the mating and internal surfaces must be ground. The problem is that the part cannot be clamped by conventional methods for grinding. Clamping sets up enough stresses to ruin the part for its eventual role in the complicated mechanism of a missile.

The final solution was pressure

sensitive tape, sticky on both sides. (Figure 2). The bearing surface on the part was a circle, about two inches in diameter and a quarter of an inch wide. At first, the grinder operator flatly refused to attempt to grind this part, worth about $300 at this point, while it was being held only by tape. This man, considered to be one of the most skillful grinder hands in New England by the management at Brookfield Machine, wanted no part in ruining a piece of fine work. Finally he reluctantly agreed to try it only after he was convinced there was no other way and that this was being done as an experiment in which no one would hold him responsible if the method failed.

To his surprise, it worked fine. Now the double sided tape is standard procedure on work that can't be held in any other way.

Centering the work on the faceplate is, of course, essential for this precision work. This company uses an electrical device which insured concentricity within 10 millionths of an inch. Using an Indi-Ac indicator (made by the Cleveland Instrument Company) they can center the work to the required accuracy after it is mounted with the tape.

Small Parts

Many small parts are ground on outside diameters by centerless machines. This usually presents no particular problem when a quantity of parts can be fed through the grinder in a continuous stream. Grinding just a few parts in this manner can be a problem. One solution is to feed the small parts through preceded and followed by a scrap rod of the same size and material to keep the grinding action continuous until the work has passed through.

Surface grinding the ends of small pieces, if they are of small diameter, becomes a problem if a magnetic chuck is used because the parts are not large enough to span the poles of the magnets. O. S. Walker Company, makers of magnetic chucks, developed two methods of solving this problem for a customer.

For grinding a single small cylinder, they devised a steel disc with a hole in the center which just fit around the workpiece. The disc was then cut in half. When fitted around the work on a magnetic

FIGURE 1

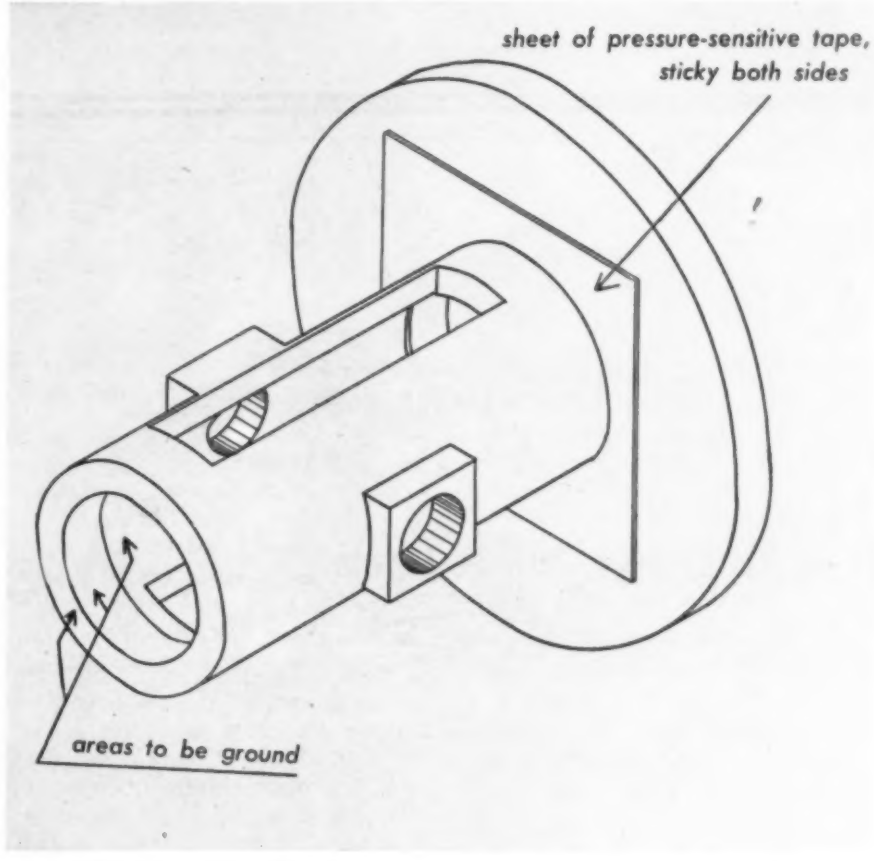
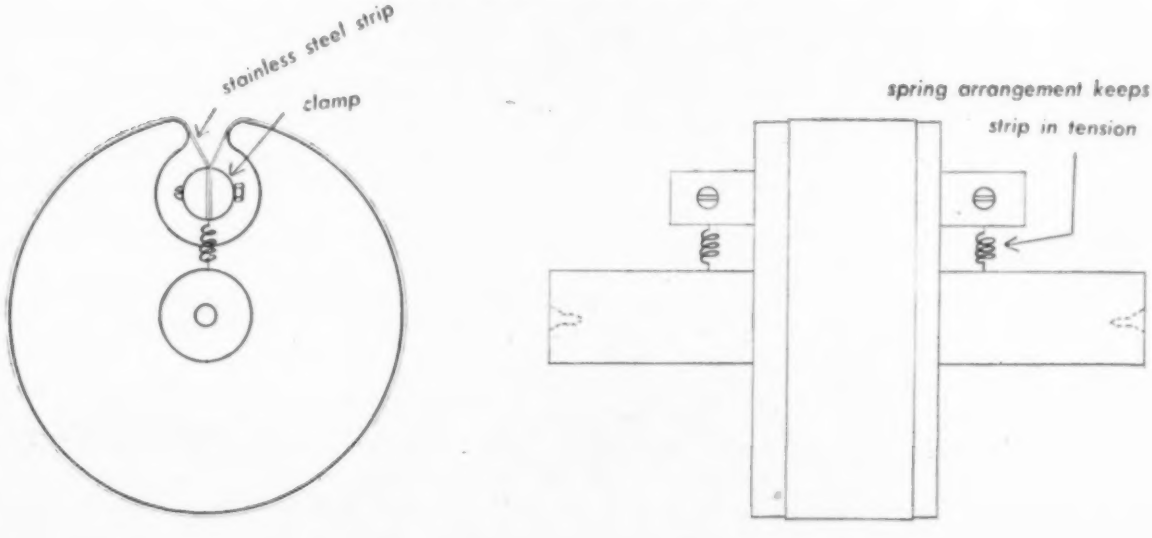


FIGURE 2



Sometimes the secret of grinding small parts lies in the holding as much as in the grinding

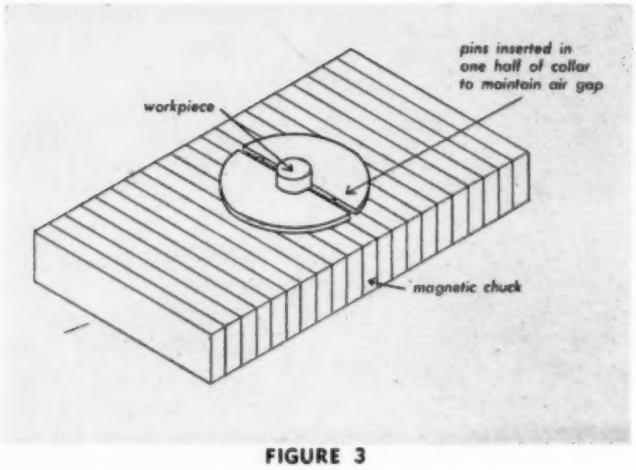


FIGURE 3

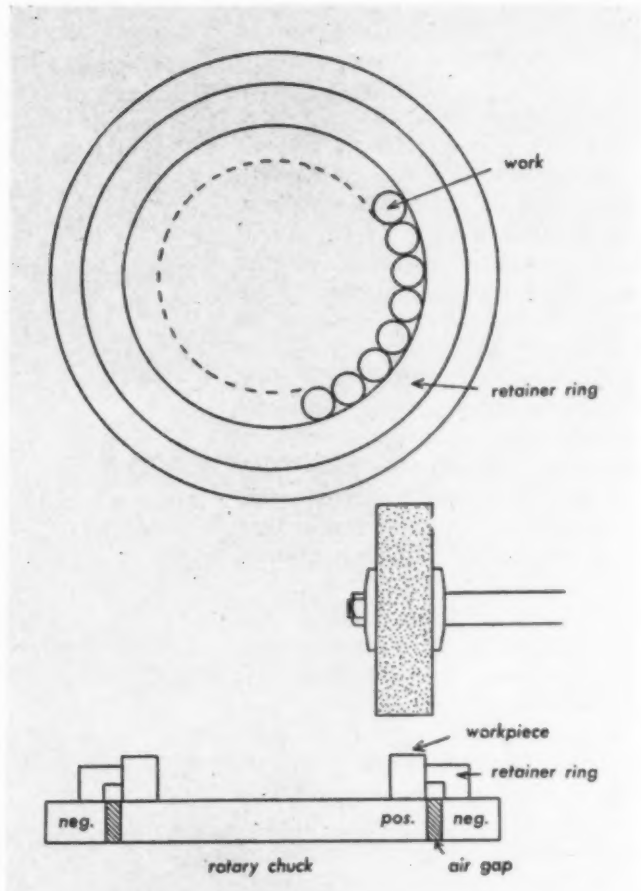


FIGURE 4

How to Grind Small Parts

chuck, the area of magnetic contact was increased enough to hold the work. (Figure 3).

For grinding the same type of work where larger quantities are involved, they devised a work holder for a circular magnetic chuck on a rotary table surface grinder. In this case, the surface of the chuck on which the work rested was one pole and the ring which retained the parts was of the opposite polarity. (Figure 4).

Thin Parts

Surface grinding of very thin parts can be done in several ways. Ferrous materials can be held on a magnetic chuck. If the work is very thin, there is a danger of grinding thin spots between the poles of the magnet. This can often be eliminated by cushioning the work with a thin (.060") piece of resilient rubber. Sometimes a cushion of machine oil is used. It is important, of course, that the chuck surface be ground flat before this type of work is ground.

If the part to be ground is nonferrous, there are several ways of holding it. The vacuum chuck is one practical solution. Another is pressure sensitive tape, sticky on both sides. Be sure that the coolant used will not affect the adhesive. Shellac is used sometimes to cement thin work to a steel backing plate for grinding. Cements, too, are available for this same purpose. Glyptal Cement, a product of General Electric, is readily applied and can be removed with a special solvent. De Khotinsky Cement, a resin-like material by Central Scientific Company, is likewise a suitable material for bonding thin work to a back-up plate.

Unusual Materials

Sometimes the grinding problem involves an unusual material as well as a holding problem. This was the case in slitting feathers for use in fly tying or arrows for archery. Here the trick was holding the feather for slitting with a cut-off wheel so that the wheel would cut right through the center of the quill. This was solved (for limited production at least) by molding plaster of Paris to fit the curve of the feather and holding the quill straight with pins. The cut-off wheel then cut through the quill and the plaster giving a neat, clean cut.

Grinding corn cobs for the familiar corn cob pipe was achieved by mounting the pipe bowl on an expanding rubber mandrel fitted to the inside of the bowl. A coarse silicon carbide wheel made quick work of finishing the outside of the bowl.

Another cutting-off operation which required careful positioning is cutting coil springs such as those used in automobile suspension systems. (Figure 5). The trick is to start the cut at the very top of

the coil so the wheel is equally supported on each side at the start of the cut.

Combinations of Materials

Sometimes the grinding problem arises when the part to be cut consists of two or more materials. Such was the spark plug slitting case. To check the condition of spark plugs after different lengths of service, one automotive manufacturer wanted to slit the plug lengthwise. This involved cutting three materials, steel, tungsten and porcelain. Any of these materials alone is readily cut by different types of abrasives. A diamond wheel is usually used on porcelain for example. However, a diamond wheel cutting through the tough steel body of the plug would soon be ruined. As a compromise a 37C80-MB9 cut-off wheel, used with plenty of coolant, was selected. While not the ideal wheel for the individual materials, it gave a satisfactory cut through all three at once.

Cutting-off stainless steel-clad plywood was a similar problem. The customer specified that there should be a minimum of burr and discoloration along the cut. Here the problem was to combine the abrasive action needed for the stainless steel with the cut action required for the plywood. The answer was a Crystolon D-sided wheel of about 100 grit size used with coolant. The rough D-side wheel provided the saw-like action which resulted in a satisfactory cut.

Occasionally the problem is to grind an "ungrindable" material. Such was the case of the paper maker who wanted sponge rubber rolls ground smooth and parallel. The rubber was so soft, that just laying it on the table caused it to deform. The solution to this problem was dipping the roll in water and freezing it. When mounted between centers, the roll was readily ground to the desired size and finish. Here again the wheel was silicon carbide with a coarse grit, soft resinoid bond.

Summary

In grinding very small or thin parts, the selection of the proper grinding wheel is based on the selection for a normal sized piece of the same material. Light cuts and plenty of coolant (where used) are important.

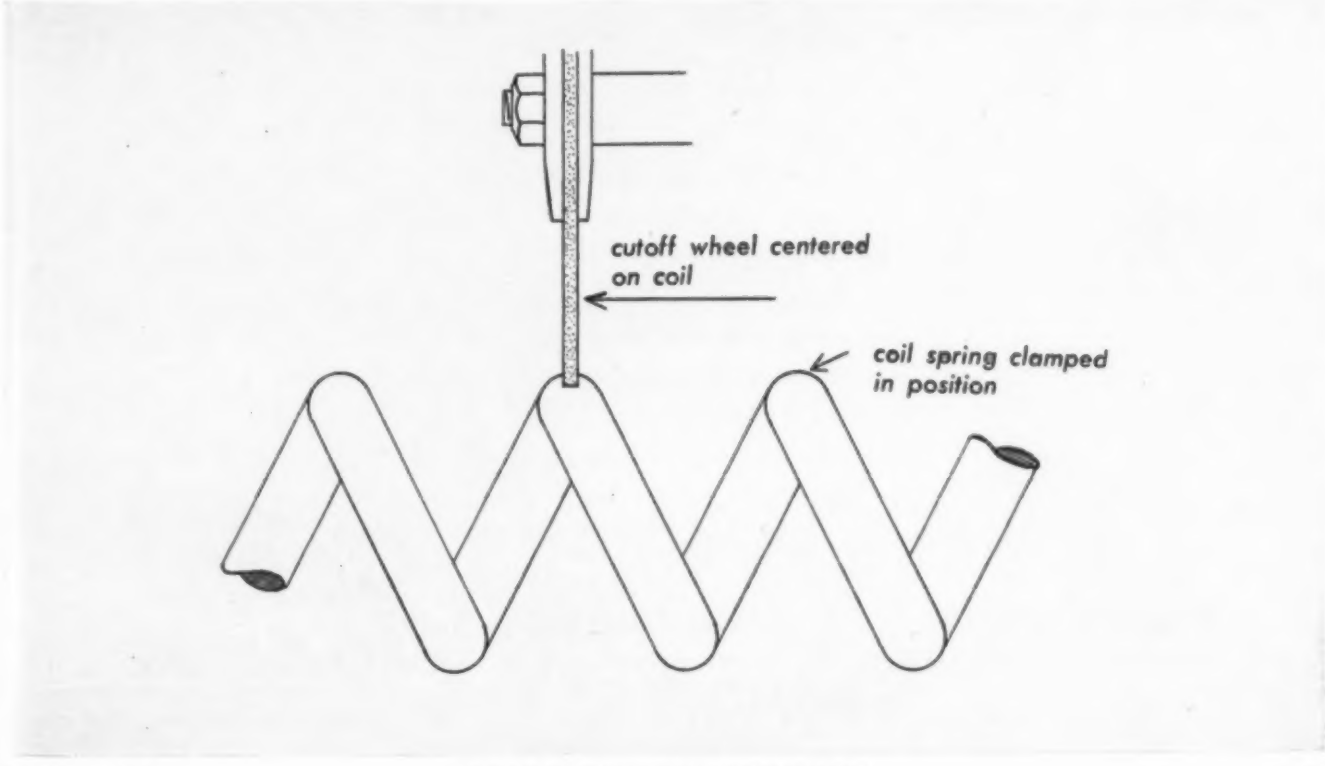
In grinding or cutting-off combinations of materials, the problem is somewhat more complicated. First analyze the grinding of each part by itself. Then decide what effect each material will have on the individual wheels. In the spark plug slitting example, a diamond wheel would have been the best choice to cut the porcelain, but it would not have stood up well cutting through the steel body. A familiar rule-of-thumb is to use silicon carbide for non-ferrous materials, and aluminum oxide for ferrous materials. Silicon carbide will cut porcelain, and it will cut steel, although its grinding action in steel is not as good as aluminum oxide. In this case a relatively fine grit (100) was used to give a smooth cut for examination purposes. A rubber bonded cut-off wheel was selected, likewise for a good, smooth cut. To keep the cutting action free, a soft grade was chosen.

When cutting or grinding a combination of materials, a soft wheel is usually recommended to insure a free cutting action. If the operation is successful, you can try a harder grade wheel later for longer wheel life, if that is important.

Solving those unusual grinding problems can be done with a little experimentation based on experience with conventional grinding. Ask for opinions from other experienced shop people. Sometimes the absurd suggestion works.

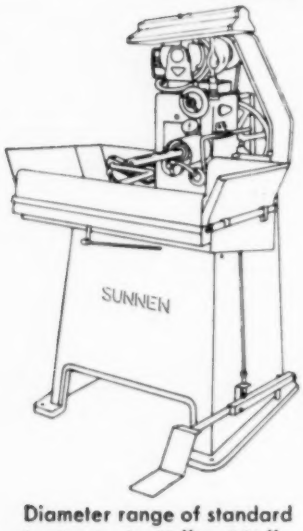
• • •

FIGURE 5



HOW WOULD YOU CHUCK THIS PIECE?

Problem: Finish I. D. perfectly round, straight and smooth



Diameter range of standard honing tools: ⅛" to 2⅝"

The only answer: *Don't chuck it!*

The slightest radial chuck pressure or end clamping would distort this thin-walled part and result in spring-back after boring or grinding.

Sunnen Honing handled the job successfully because the workpiece is self-supporting on the honing tool. As the part is hand-held, there's no localized pressure to cause distortion . . . no strain to cause spring-back.

Your problem may not be this difficult, but Sunnen Honing can save you money if you do precision internal work of any type. It requires no jigs or fixtures, guarantees accuracy to .0001" and produces any finish down to 2 micro-inches. Average honing machine installation with tooling is about $1,000.

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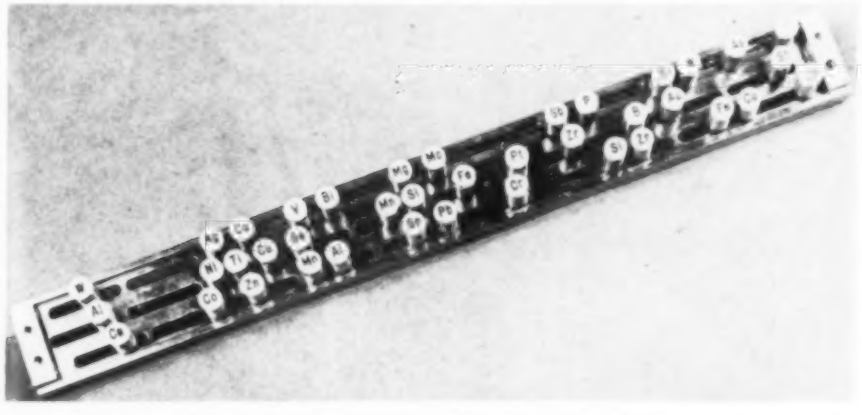
LABORATORY EQUIPPED WITH AUTOMATIC SPECTRO-LECTEUR. On the right, the Electrostatic-Screening Cabinet. In the middle (light grey) the Jobin & Yvon quartz spectrograph. At the left end of the spectrograph, the Direct Reading Head in front of the Automatic Control Cabinet. On the left, the Amplifier and Recorder Cabinet. The operator is sliding the Direct Reading Head into correct position by means of the micrometer drum, following the observation of the intensities of the two direct reading milliammeters.



Close-up view of the analysis ruler in "INVAR" steel, showing the hardened steel studs corresponding (at ±1 micron) to the position of the lines on the spectrum.

• Intercontinental Electronics Corp., Mineola, N.Y. is introducing in this country, the Automatic Spectro-Lecteur, the first direct reader which permits measurement of instantaneous values, and, therefore, direct and instantaneous reading of analysis results without resorting to integration. In direct reading spectro-chemical analysis, the measurement is achieved by means of photomultipliers.

The "Automatic Spectro-Lecteur" only includes two photomultipliers; one views the line of the basic metal in the alloy, whereas the other one travels automatically along the focal plane of the spectrum, stopping at selected lines for a determined length of time according to a pre-arranged program. Thus there is a continuous measurement of instantaneous values of the intensity ratio between the recorded lines and the line of the basic metal.

Any integration masks all the phenomena that may take place during the time it is performed. Only the final result is known, giving no indication as to what error, due to the length of the stabilization period, may have occurred during the process.

This unit makes it possible to know all the factors which are instrumental in the determination of the best operative methods. It successively records all

DIRECT READING HEAD showing the inside mechanism. The main parts are: A) Analysis Ruler. B) Program Ruler. C) Temperature Compensator.

the elements according to their own period of stability, which is an essential point in spectrochemical analysis.

A Spectro-Lecteur can be installed in the plant ready for operation in one or two days.

The analysis of a metal alloy including six elements is completed within 57 seconds. The Spectro-Lecteur can change over from one type of alloy to another one, the base metal of which is different, within two minutes.

The continuous recording in direct connection with the source assures a permanent control of the whole installation.

Because the system includes only two photomultipliers, only two electronic circuits are required.

VAN NORMAN

Van Norman 4BG2 "Bowgage" double head production grinder illustrated. Capacity: 10" swing double work head. Grinding wheels: 30" diameter — up to 6" face. Grinding wheel motor: 10 to 20 HP.

VAN NORMAN MACHINE

A DIVISION OF VAN NORMAN INDUSTRIES, INC.

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

"Bowgage" Production Grinders

Cut Costs • Boost Output

Actual case histories on the massive Van Norman 4BG "Bowgage" Production Grinders continually show users effecting substantial savings through increased production and lowered costs.

These Van Norman production grinders are engineered to give you accurate, fast, economical mass production. Let Van Norman help solve your mass production grinding problems — write, wire or phone now for complete details on the Van Norman 4BG "Bowgage" Production Grinders.

COMPANY
SPRINGFIELD 7, MASSACHUSETTS

Don't wait . . . for extra profit install a Van Norman "Bowgage" Production Grinder now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.

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PROPERLY-CHUCKED CASES being surface ground in multiple on Mattison heavy vertical-spindle machine.

Chucking Work for Surface Grinders

• Various adaptations of magnetic chucks are used for holding work at surface grinders. Aligning strips may be used on the chuck where found desirable. Steel rings may be used to confine non-ferrous work. Certain modern devices allow adjustment of the holding power of a chuck, so that untrue sides of workpieces will not be pulled too positively flat when grinding the initial surface. Auxiliary magnetic plates are sometimes pre-machined to hold specific types of workpieces in given positions. Surface grinder engineers can generally design and build various combinations of magnetic and mechanical fixtures for use in conjunction with magnetic chucks.

There are certain distinctions with reference to good chucking practice on vertical-spindle grinders of production type, however, as against horizontal-spindle machines. On vertical-spindle grinders made by Mattison, for instance, having a single massive spindle and cylinder wheel positioned above a reciprocating work table, it is important that many types of work being ground should be positioned central to the wheel. Also, the table should not be loaded any wider than the inside diameter of a cylinder wheel.

Where workpieces are loaded on the chuck at a vertical-spindle machine central with the wheel, clearance for chips produced by the wheel will be improved; in consequence, grinding will be at optimum efficiency. Moreover, the scratch pattern left on work loaded in this way will be such to show only the center of the wheel curvature. Better-looking surfaces will result.

Pieces loaded in series for surface grinding at a machine of this type can often be so positioned, either with or without spacers, as to offer mutual support to one another during the grinding process. This is sometimes found particularly helpful where workpieces are higher than ordinary. Grinding on the cases shown in the picture is an interesting instance of what is meant.

• • •

Grinding Wheel Gage Provides Fast and Non-Destructive Uniformity Test

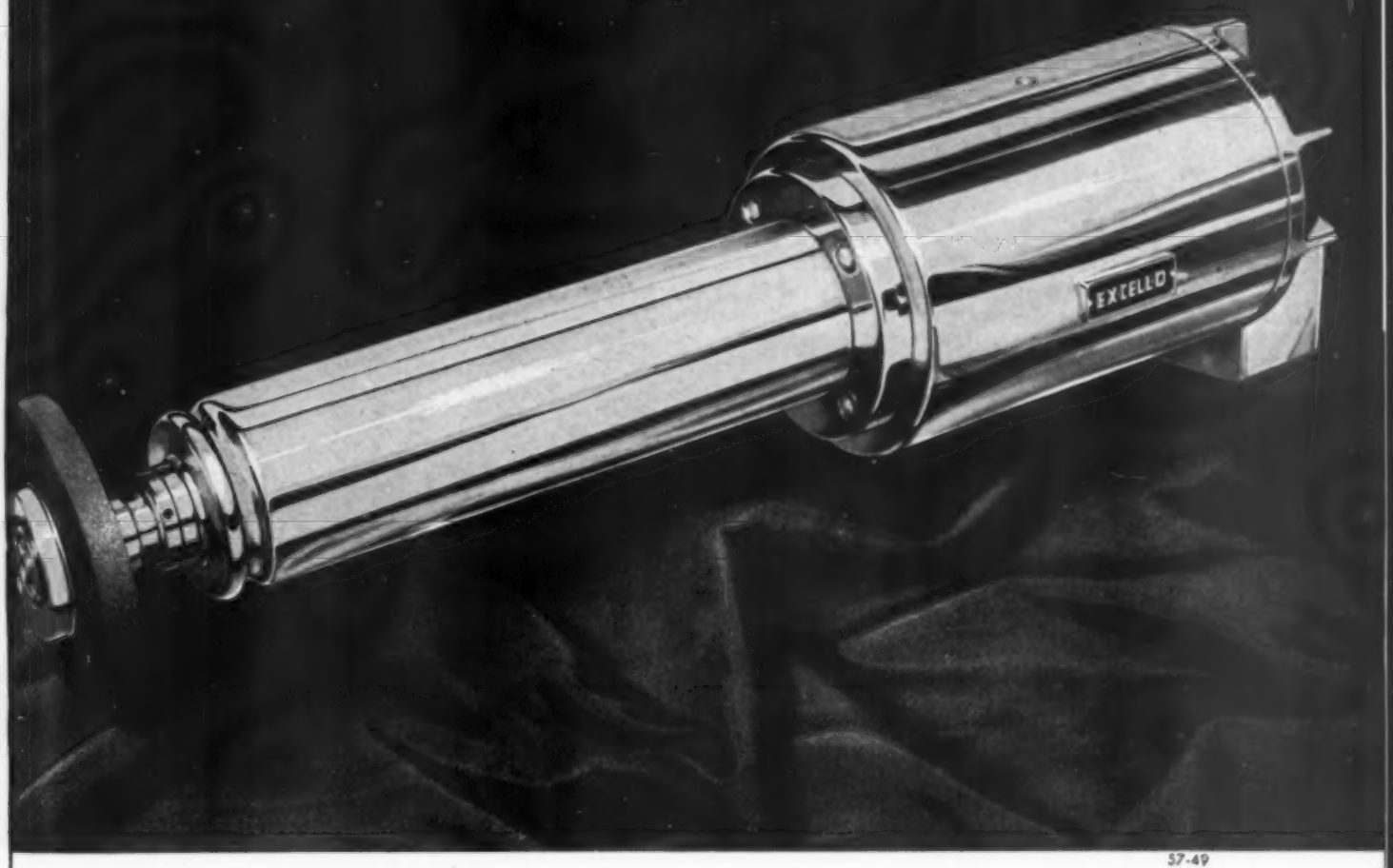
Tests by users of grinding wheels indicate that a new Sheffield air gage is making possible effective non-destructive comparative tests of density uniformity in grinding wheels, honing sticks and other abrasive tools and products. The gage, consisting of either a three- or four-column Precisionaire, flows air into the grinding wheel and gages the flow by means of scale graduations known as the Sheffield index. While graduations have no relationship to abrasive grain sizes, the gage quickly and accurately compares and checks uniformity.

The gage positively detects filling and provides an accurate method of exploring structural variations. It enables machine tool builders and users of grinders to select highly uniform wheels for super-precise grinding jobs where wheels of varying density would be entirely unsuitable.

The Sheffield Corp., Dayton, Ohio.

Checking grinding wheel structure with Sheffield air gage.

#100,000



57-49

Proof of Precision: This 100,000th Spindle

. . . that's right. Ex-Cell-O has produced more than 100,000 precision grinding and boring spindles. They are in use today throughout the world, on a wide variety of important jobs. No other spindle manufacturer has so solid a record for satisfaction—so sound a reputation for building the best.

EX-CELL-O FOR PRECISION XLO

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

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Special Grinding Machine For Grinding Hand Saws

Figure 1 is a close-up view of two 26-in. high quality hand saws which are manufactured with a taper grind to each side of the saw. The saws are approximately .042-in. thick at the tooth edge, and taper from the tooth edge to the back and from the tip end of the saw to the handle end, thus making a double taper to the shape. The thickness at the back on the tip end is approximately .026-in.

The saws are manufactured of a high quality steel, which is heat treated. It is necessary to grind approximately .010-in. of stock from each side of the saw.

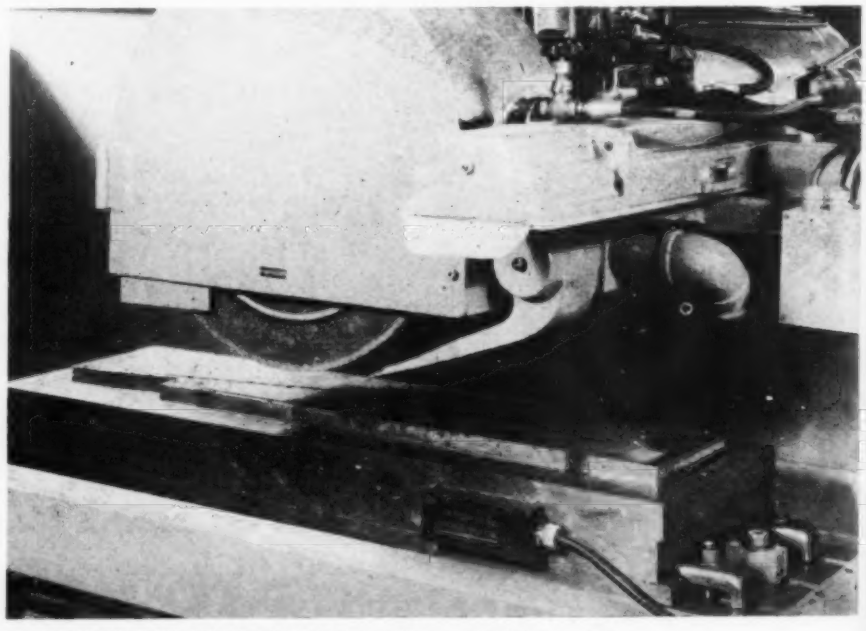
The answer to the problem was to set up two machines, shown in figure 2 which is a Thompson type "C" 12 x 16 x 48-in. machine, equipped with a 40 hp wheel head motor, utilizing a 20-in. dia. x 8-in. face x 12-in. hole wheel.

The work pieces are held on a taper flux bar and the wheel face is dressed straight with an automatic power operated wheel truing device. The machine is completely automatic in its cycle, thus permitting one operator to operate two machines. The first machine is set with two flux bars to grind the first side of the saws. The second machine is set with two flux bars to grind the second side of the saws.

The problem involved is quite unique in that thin stock is very difficult to grind with artificial abrasives with a large area contact. It is quite apparent that when the saws are placed on the flux bars the entire surface would not be touched by the grinding wheel in the initial contact, thus permitting a higher feed rate than when the saws were ground down to where the full width of the wheel was in full contact with the saws. To increase the production rate, the machine was equipped with triple downfeed rate, thus permitting a downfeed of .001-in. per reversal of the table at 100′ per minute for approximately the first .004-in. of penetration into the saw blank. The machine automatically then reduced the feed rate to .0006-in. per reversal of the table for the next .003-in. of penetration into the saw, and the remaining .003-in. of stock removal is at the rate of .0002-in. per reversal of the table, thus giving straight flat work at the maximum feed rate that can be used on this thin stock.

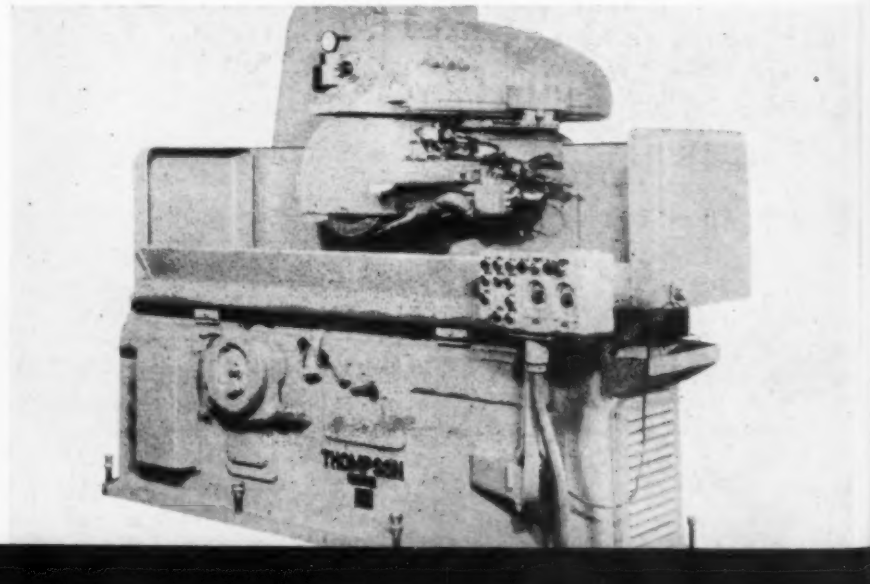
The machine is completely automatic in its cycle including the dressing of the wheel. All the operator has to do is load parts, clean the flux plates, and energize a start cycle button. The parts are automatically held on the magnetic chuck in the automatic cycle, the downfeed is automatic with automatic compensation for wheel dressing.

The triple downfeed arrangement is shown in figure 3. The production rate on such a set up is 60 complete saws in 50 minutes from one operator using two machines. • • •

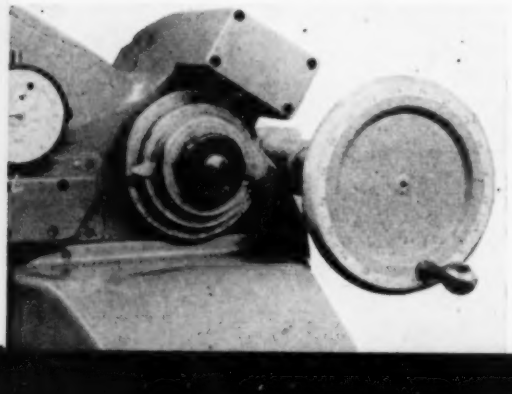


1. VIEW OF TWO HIGH QUALITY hand saws. Each has a taper grind to each side of the saw.

2. GRINDING MACHINE is equipped with a 40 hp wheel head motor utilizing a 20-in. dia. x 8-in. x 12-in. wheel.



3. THE TRIPLE DOWNFEED arrangement. Production is 60 saws per operator on two machines in 50 min.



Johnson's major contribution to coolants fits today's high-speed production needs!

Coolants were just coolants for 50 years until Johnson's Wax Research developed formulations using *waxes* and *wax-type synthetics*. Johnson's Metalworking Fluids are as modern and efficient as your 1957 machine tools. They give you superior performance even on your toughest jobs — because Johnson's lubricates and cools under conditions where ordinary coolants fail because of extreme heat and pressure.

Use Johnson's on your fastest machines, with your hardest-to-machine metals, and compare results obtained with conventional coolants. In hundreds of shops across the country, Johnson's coolants for machining, cutting and grinding are reducing costs and increasing profits.

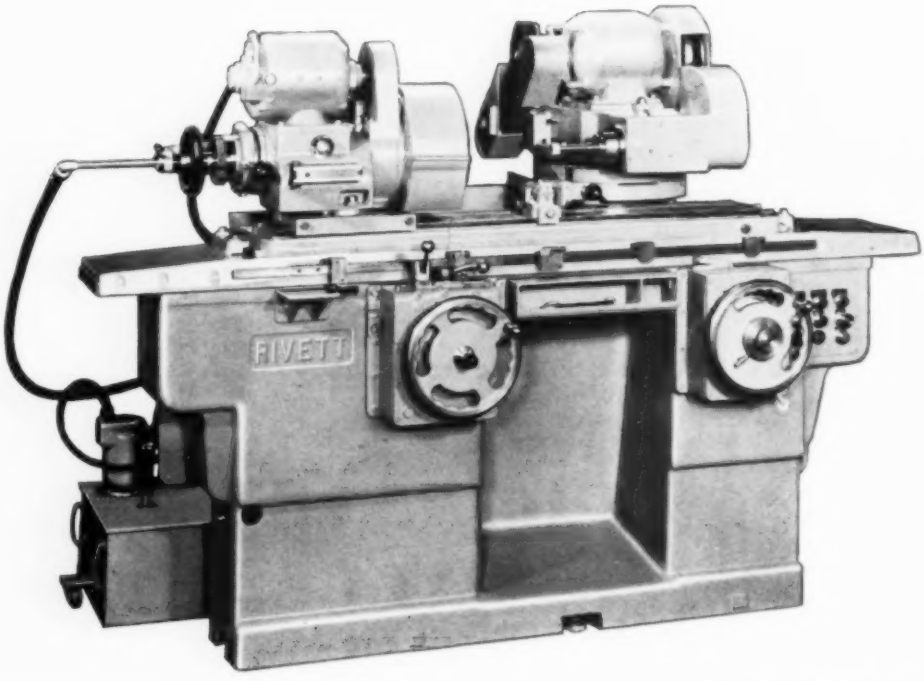
Your local Johnson's industrial distributor will be glad to set up an in-your-shop test of TL-131 — or any of the complete line of Johnson's Metalworking Fluids. Ask him about Johnson's money-back *Guarantee of Superior Performance* over ordinary coolants.

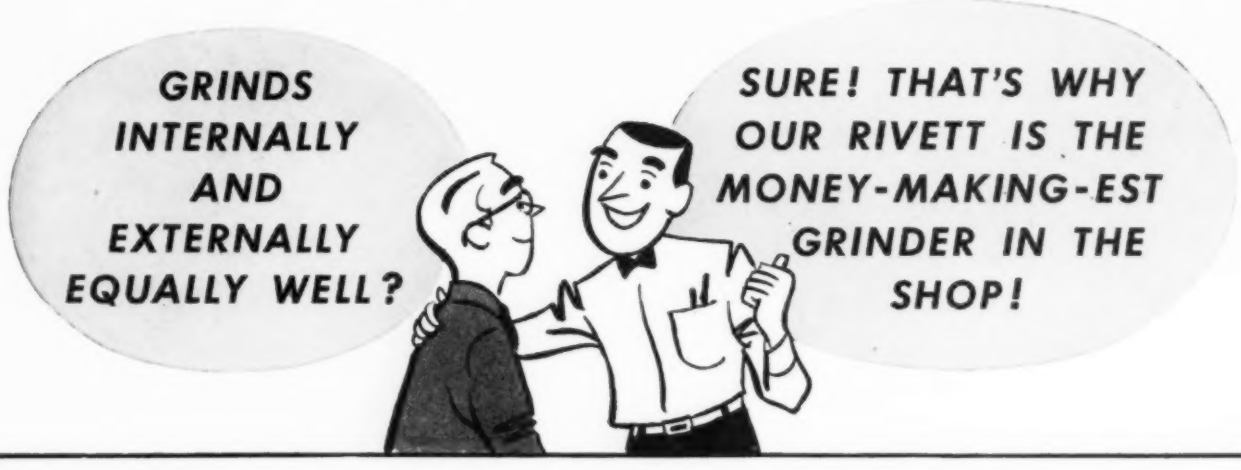
from
Johnson's Wax Research

S. C. Johnson & Son, Inc., Industrial Products Division, Dept. D-57, Racine, Wisconsin

"Johnson's" is a trademark of S. C. Johnson & Son, Inc.

Pictured below is Johnson's TL-131, one of a complete line of modern coolants for today's high-speed grinding.





Rivett 1024 Internal and Universal Grinder

You can keep this grinder always busy! Do any number of internal jobs and then switch over to external work. It has all the features of a true internal grinder — extra-long table moves sufficiently to left to permit plug gauging to 6″ depth without retracting wheelhead slide. External wheelhead is not hinged, but swivels a full 180° for quick conversion! Grinds any hole to 9″ diameter and externally to 12″ diameter.

No need for two special machines when you have a 1024! — particularly where grinding jobs are varied and production on any one run is limited!

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Department GF-10 Brighton 35, Boston, Mass.

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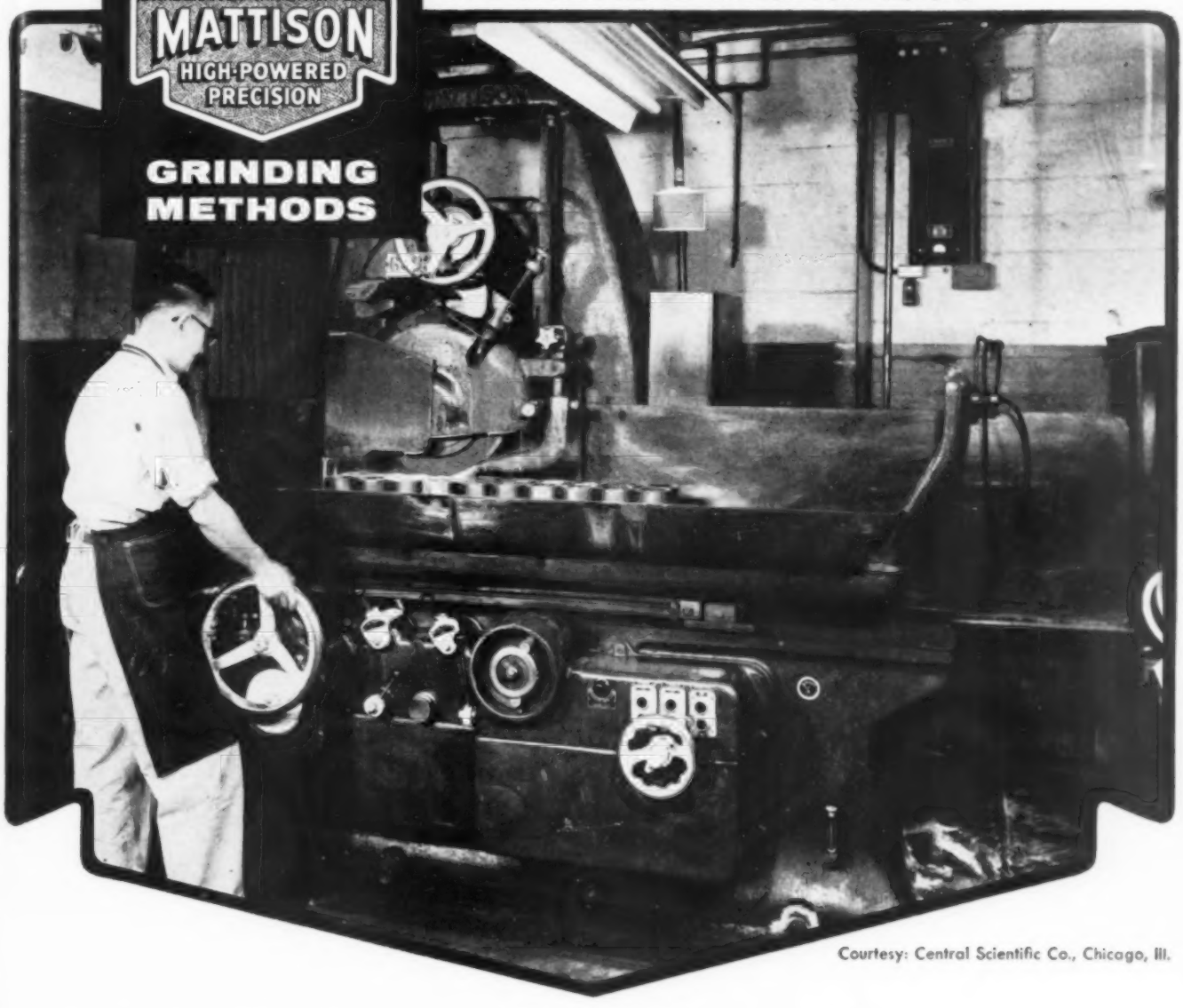
CASE HISTORY NO. 38—VACUUM PUMP ROTORS

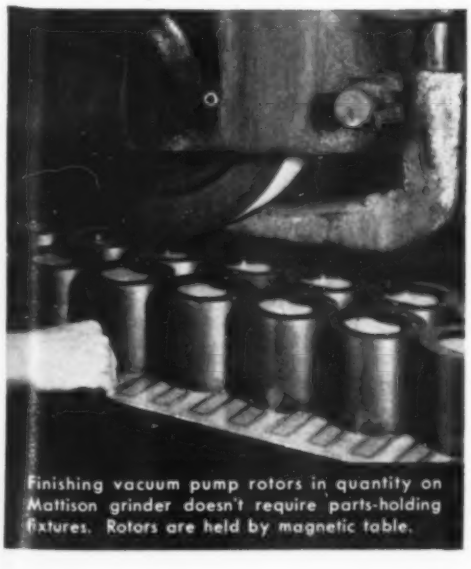
MATTISON
HIGH-POWERED
PRECISION

GRINDING
METHODS



Courtesy: Central Scientific Co., Chicago, Ill.

Switch to Mattison surface grinder doubles output ...consistent accuracy speeds assembly



Finishing vacuum pump rotors in quantity on Mattison grinder doesn't require parts-holding fixtures. Rotors are held by magnetic table.

Not only is output doubled, but improved accuracy being achieved on this Mattison high-powered precision surface grinder enables rotors for high vacuum pumps to be assembled more rapidly. Production now is 50 parts per hour compared to 12 to 25 per hour with former grinding method.

Stock removal on this job is .0015 inch with a high degree of accuracy required. Both parallelism and flatness are held to .0003 inch to assure consistent pump performance at very low pressures.

Greater accuracies also are being realized in machining a wide variety of other scientific apparatus parts. Very thin vanes for another vacuum pump, previously ground one at a time, are now ground in production lots. Reproduceability is greatly improved.

Like every Mattison grinder, this horizontal spindle unit features high horsepower and rigid construction—the design combination that means ability to handle a wide range of work with unmatched accuracy at high production rates.

MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.

HIGH-POWERED
PRECISION
SURFACE
GRINDERS

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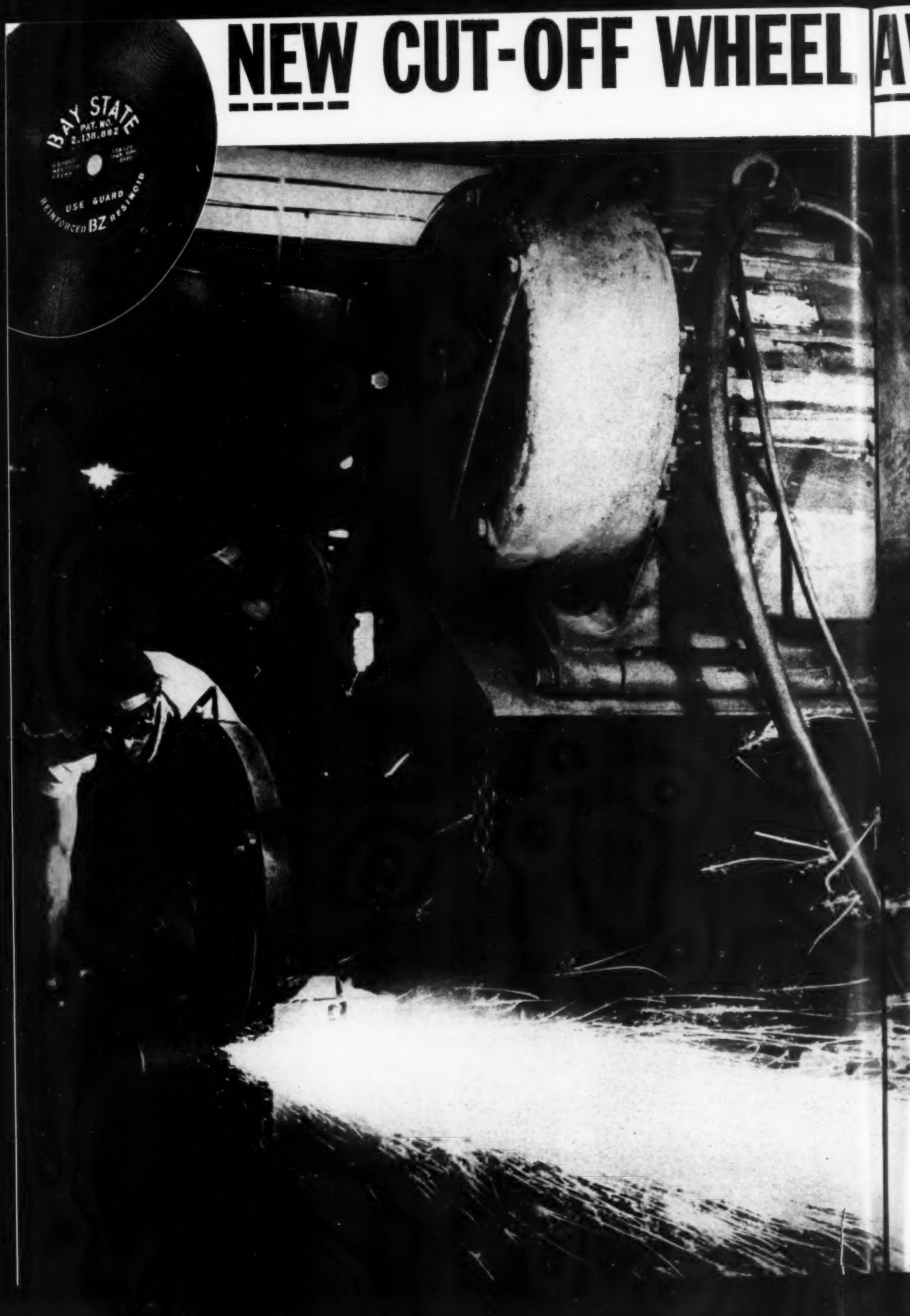
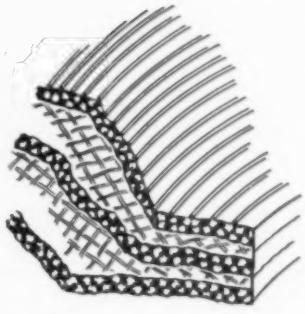

NEW CUT-OFF WHEEL
BAY STATE
PAT. NO.
2,138,882
USE GUARD
REINFORCED BZ RESINOID

L AVERAGES 33% LONGER LIFE!

The records being set for all-round cutting efficiency by Bay State's new BZ2AA cut-off wheel are the results of careful and continuous research.



Cut-away wheel section showing reinforcement between layers of bonded abrasive.

Modern cut-off operations involve tremendous speeds, pressures and temperatures. If one of the three major cut-off wheel components . . . abrasive, bond or reinforcement . . . wears at a different rate from the others, cutting efficiency and wheel life fall off drastically. In the BZ2AA, Bay State has developed a new method of controlling these wear rates through the use of an improved bond. Now the three components are more perfectly matched, resulting in peak grinding efficiency.

In controlled laboratory tests the new BZ2AA wheel lasted an average 33% longer than the runner-up, Bay State's BZ2. Below are results of two such tests. They are typical of hundreds which have been confirmed in cutting gates and risers in leading foundries across the country.

Test #104 — Dry cutting cold rolled steel 1" square.
Wheel size: 16 x ⅛ x 1

	No. of cuts per wheel	
	BZ2	BZ2AA
	156	228
	157	193
	161	210
Total cuts	474	631
Average	158	210

Result: 33% more cuts per wheel with BZ2AA

Test #210 — Dry cutting cold rolled steel 1½" round.
Wheel size: 16 x ⅛ x 1

	No. of cuts per wheel	
	BZ2	BZ2AA
	58	71
	57	82
Total cuts	115	153
Average	57.5	76.5

Result: 33% more cuts per wheel with BZ2AA

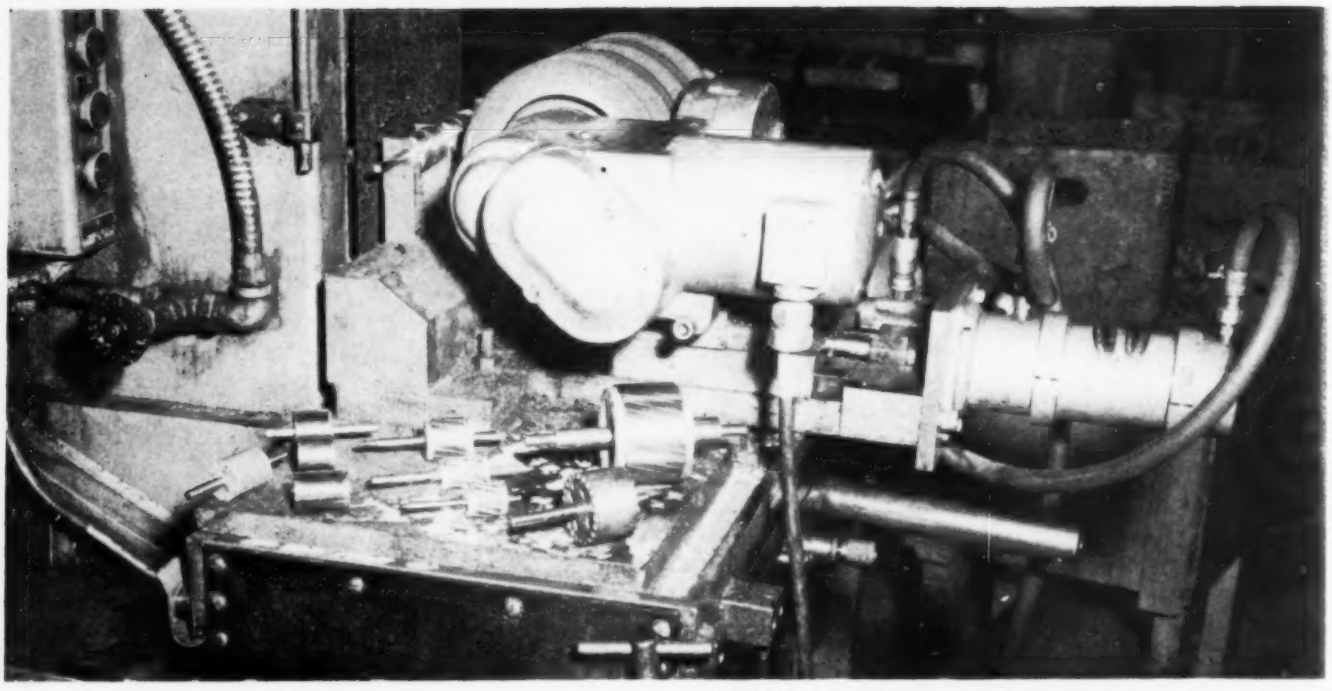
The best proof of the BZ2AA's superiority is a test in your own cleaning room. Your Bay State representative will welcome the opportunity to arrange for such a test.

Write for descriptive sheet with full information.

BAY STATE ABRASIVES

BAY STATE
WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Mass.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.
Distributors: All principal cities. Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario.



PNEUMATIC FIXTURE moves forward until revolving regulating wheels contact rotors. Machine table then carries rotors in against abrasive belt until pre-determined size is reached

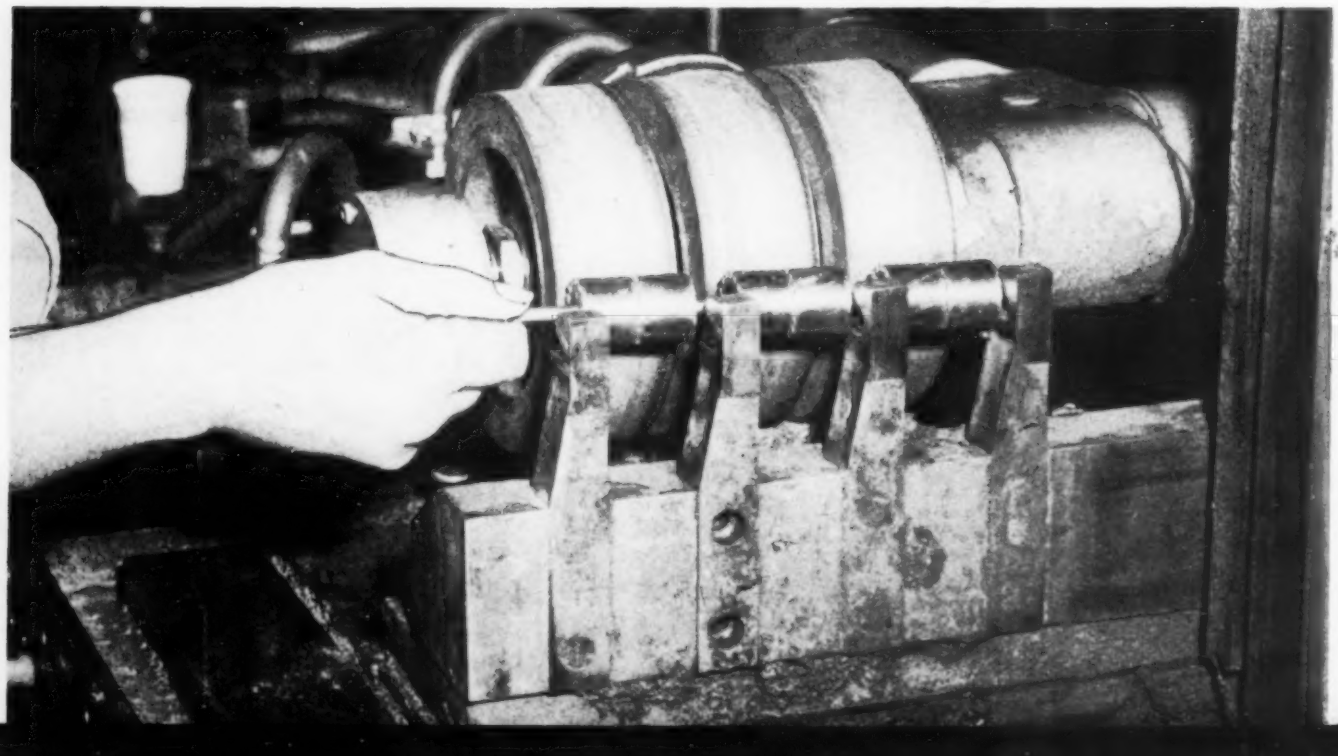
With five-fold increase in production rates over conventional grinding methods, small electric motor rotors can be belt-ground to .0001-inch concentricity tolerances, and diameter tolerances, of plus or minus .0005-inch. Key feature of modified platen-type Engelberg belt grinder is oscillating automatic in-feed table combined with special multiple cylindrical grinding fixture.

New method for

Grinding Rotors Concentric

● Through use of a specially fixtured abrasive belt grinder, small electric motor rotors can be finish ground four to five times faster than by conventional methods, to .0001-inch concentricity tolerances. This new adaptation, developed by Engelberg Huller Co., Syracuse,

WITH HYDRAULIC FEED TABLE in load position, slide fit arbor shaft, loaded with six shaded pole rotors, is inserted in carbide-lined V-blocks of holding fixture.



N.Y., is a modified platen-type machine equipped with oscillating hydraulic in-feed table and pneumatic cylindrical grinding fixture.

Rotors, ranging in size from ¾-inch stack (width) to 1½-inch stack, and from ½-inch dia. to 1½-inch dia., are multiple loaded on slide fit arbor and inserted in carbide-lined V-blocks of work holding form. The air-operated cylindrical grinding fixture, mounted on automatic in-feed table, consists of three rubber wheels, six inches in diameter, with 1½-inch face. The regulating wheels, at 12 rpm., revolve the rotors against the abrasive belt, which is backed by a hardened steel platen with ½-inch carbide insert behind contact area.

Hydraulic In-feed Table

The modified Engelberg Model BG8/FT9 is equipped with a two-speed hydraulic in-feed table. From the load position, the first speed allows for rapid approach to the grinding belt; a microstop regulates the second or machining speed as the revolving rotors are moved in against the belt until a predetermined size is reached. At the same time, to equalize belt wear, rotors are moved back and forth across the belt face by means of an air cylinder oscillator attachment on machine table.

The machine permits concentricity tolerances down to .0002-inch, and diameter tolerance of plus or minus .0005-inch. The complete grinding cycle—loading, grinding, and unloading—requires about 12 seconds. Depending on width and diameter of rotors, production rates can exceed 2000 rotors per hour.

Preliminary tests and production data on the first installation—at Olsen Machine and Tool Co., North Abington, Mass.—indicate that rotors, either riveted type or die-cast, should be lathe turned or die-trimmed to within no more than .010-inch oversize for final presentation to the abrasive belt machine. Production data above, on alternating-current shaded-pole rotors, is based on .005-inch stock removal. Rotors were copper and CR silicon steel laminated into stacks from ¾ to 1½-inches thick.

The belt grinder eliminates the need for fixing rotor shafts prior to finish grinding, formerly necessary for locating purposes. As many as 12 rotors, depending on width, can be nested simultaneously. After finish grinding, shafts are knurled, threaded and hydraulically pressed. Total maximum run-out, upon completion, is .0005-inch (.00025-inch per side), well within tolerance requirements for quantity production of small electric motor rotors.

This method can also be used to finish grind fixed-shaft rotors, with less favorable production rates because of multiple loading limitations. Closer tolerances are also possible, but with resultant increases in required net grinding time. Gear train can be changed to increase rpm of regulating wheels for rotors above 2¾-inches in diameter.

Wet belt recommended, 9 x 107 inches, is 40-grit aluminum oxide, with 40 to 1 solution of water soluble oil as coolant. Belt speed is 5000 sfpm, and Olsen reports belt life of over 12,000 rotors per belt.

Initial equipment expenditure is approximately 40%, and floor space about half, of that required for conventional hard-wheel cylindrical grinder installations. Since the cylindrical grinding fixture is readily removed from the in-feed table, the Engelberg machine can also be used for flat surfacing operations for which it was originally designed.

Another advancement in perforator grinding...

the NEW HARIG Grind-All FIXTURE

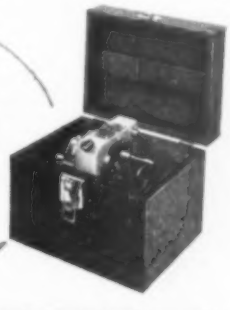
Easily grinds irregular shaped perforators concentric with shank within ± .0002 accuracy. Also can be used for light milling and boring fixture, inspection tool, etc.

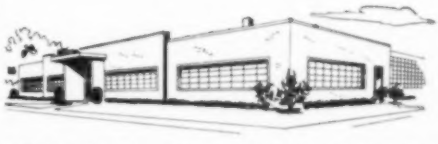
1 Single locking screw—fast action v-block adjustment holds it in desired position.

2 Handy crank speeds rotation of index plate.

3 Hardened and ground construction — a life-time of service and precision accuracy.

For your convenience . . . Handy Leatherette carrying or storage case supplied with Grind-All Fixture.





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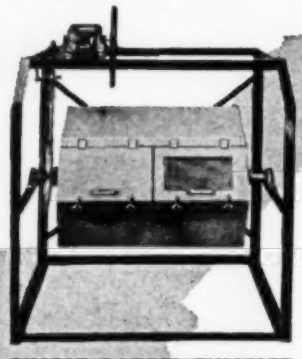

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1 to 7½ H.P. Ball Bearing V-Belt Drive. Pre-determined speed set at factory or to your specifications. Buffing wheels and compounds available for every industry . . . Special compounds recommended for Special applications.

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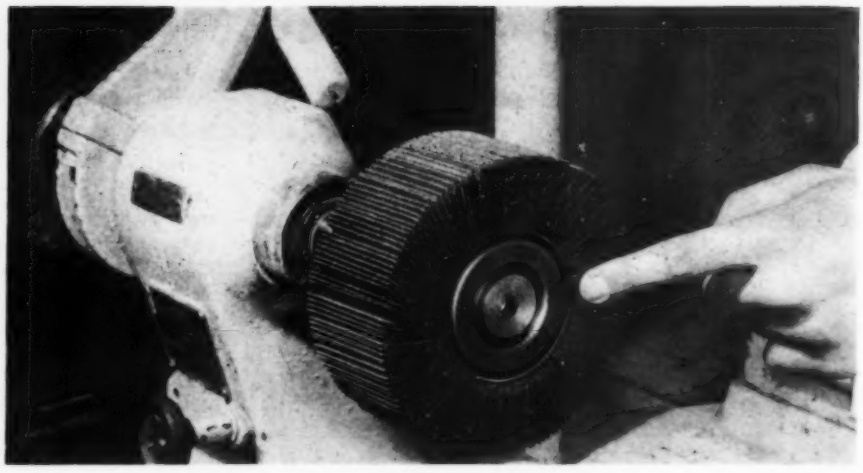
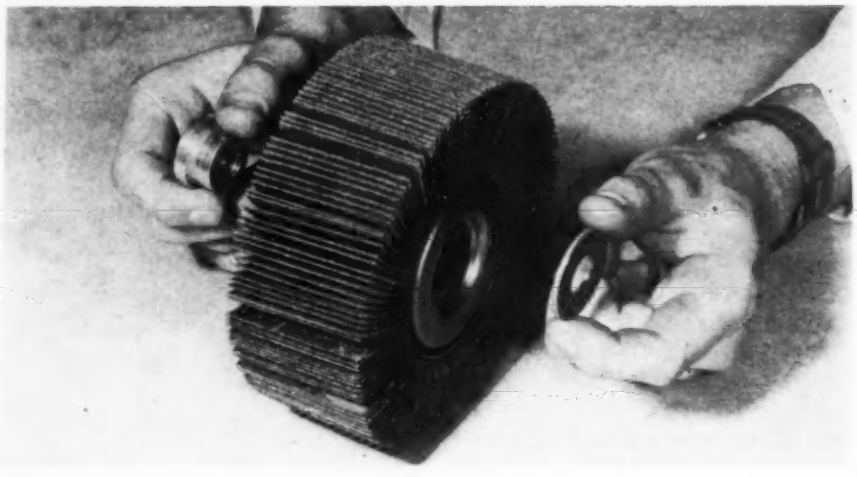


Recessed flanges . . .



. . . permits flush sanding on any spindle

• Disposable flanges and a design that permits flush sanding are two major improvements in its line of small coated abrasive "PG" (polishing and grinding) wheels for finishing and maintenance operations, according to Minnesota Mining and Manufacturing Co., St. Paul, Minn.

The new disposable flanges, which lock the wheel's coated abrasive leaves securely in place, are factory-installed and bonded to the core. This construction technique makes it unnecessary to remove the flanges when a wheel change is required; it's simply a matter of slipping the "PG" wheel on the spindle and tightening the cap nut. Performance characteristics of the wheel remain unchanged. The new disposable flanges provide hub strength not previously available on the small "PG" wheels.

Another feature of the newly-designed wheels is that the flanges are recessed into the side of the wheel. The end cap nut is also recessed, so that the wheel can be used flush against a surface, as in finishing a right angle or corner. The new recessed-type flange also allows the wheels to be ganged more closely to obtain a wider abrasive surface. The recessed flanges are available on all diameters of the small (6" through 10" dia.) "PG" wheel line, and on widths 1½" and up.

Specifications

Specifications for the new flanges include a standard 1" center hole on wheels 6" in diameter; and a standard 1¼" center hole on wheels with a 7", 8", 9" or 10" diameter. Wheels 11" and larger—known as standard or large "PG" wheels—will continue to use changeable aluminum flanges.

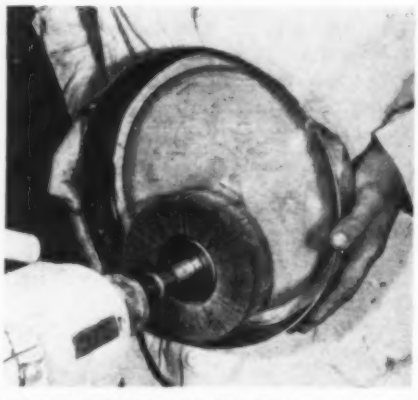
Three new adapter kits designed for

use with the disposable flange-type "PG" wheels make it possible to fit the wheels onto any portable tool or bench lathe.

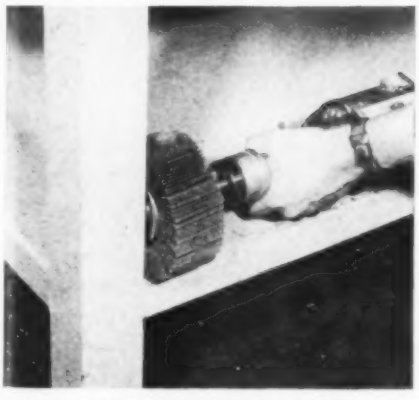
Further information about the small "PG" wheel line is available from the 3M company, Dept. F7-268, 900 Bush Street, St. Paul 6, Minn., or from the firm's branch offices in principal cities.

• • •

ATTACHED TO A BENCH LATHE, the recessed flange "PG" wheel is readily available for off-hand operations "head-on", or those requiring a finish into a right angle corner.

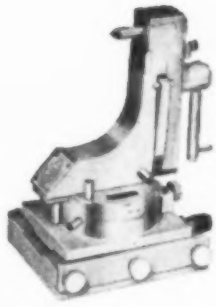


FOR CONTOUR SANDING where the end of the wheel must be in contact with a flush surface, the small "PG" wheel is naturally suited; quickly takes the contour of the area being finished; holds that contour until reshaped.

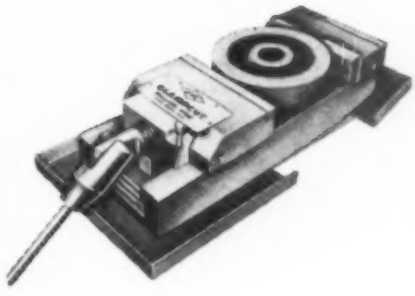


FOR MAINTENANCE WORK and smoothing welds for painting, the new small "PG" wheel with the recessed flange and end cap nut is adaptable to straight shaft grinders.

J&S DOWN-HOLDING DEVICES and WHEEL DRESSERS LEAD THE FIELD

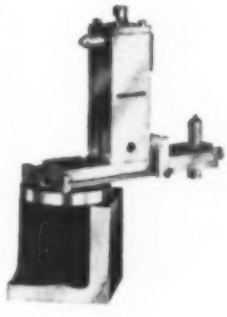


Fluidmotion Wheel Dressers—Dress two angles tangent to a radius, using ONE handle in one continuous motion. Operation is so fast and simple that beginners can use them. For all types cylindrical and surface grinders.



J & S Swivel Vise—The only hardened and ground swivel vise that mounts low, swivels, needs no pedestal. Patented down-holding clamping jaws give many times the holding power of an ordinary vise, yet only half the weight.

J & S All-Purpose Jaw Clamps — For any machine table or face plate. Five models—one adjusting screw has a holding force of 2½ tons on Small model, 12 tons on Jumbo model. Eliminate u-clamps, straps and fingers. No obstruction problems, no interference with measuring tool readings.



J & S Form-Master—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12" convex, up to 15" concave.

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Films Available

1. "A Challenge for Steel"

Where can pre-finishing of steel be done most economically and profitably —in the steel mill or at the fabricating plant?

Can a mill profit from strip grinding carbon steel, and sell it as polished stock?

Can a mill achieve a No. 3 quality through a slight reduction on bright rolls, and sell it without prohibitive extras?

These are among questions raised by a new thought-provoking motion picture dramatizing mill and fabricator practices in finishing stainless and carbon steel, produced by Minnesota Mining and Manufacturing Co., St. Paul, Minn.

Designed for in-plant showing to production, sales and executive management personnel of steel mills and fabricating plants, the color film—called "A Challenge for Steel"—is available for showing as part of an over-all presentation dealing with coated abrasives and their application to production line problems.

Conducted by 3M company personnel, the in-plant meetings are planned for an hour in length, and include a review of coated abrasive components, a showing of the film, a technical presentation pointing up factors affecting coated abrasive usage, and a general discussion period. All of the finishing practices shown in the film, which was made at several production line locations, can be adapted to specific finishing problems.

Among the coated abrasive finishing methods shown in the film are those for wide sheet grinding and polishing, strip scouring, and coil grinding.

Arrangements for in-plant meetings can be made through Minnesota Mining and Manufacturing Co., Dept. F7-287, 900 Bush Street, St. Paul 6, Minn., or through the firm's branch offices in principal cities. • • •

2. "Hydraulic Oils"

"Hydraulic Oils," a 25 minute sound-on-film color motion picture recently released by The Texas Company, shows the principles of hydraulic laws and demonstrates the vital part premium oils play in getting top performance and increased production from the many applications of hydraulics in industry today.

The Texaco film, in its opening scenes, recreates Blaise Pascal's discovery of the laws of hydraulics. Pascal's 17th century laboratory is faithfully reproduced, and authenticity is added by the use of early laboratory glass, lent for the film by The Corning Museum of Glass.

The many applications of Pascal's discovery in industry are then reviewed pictorially and the essential idea of his discovery is demonstrated in a glass model of a basic power system: reservoir, connecting lines, pump, directional valves, motor or cylinder, and the hydraulic fluid.

Quality characteristics, the film points out, are built into premium grade hydraulic oils through the use of chemical additives specifically developed to impart new properties. Their superiority over straight mineral oils is demonstrated in laboratory tests and in actual performance data.

Profitable performance from premium hydraulic oils depends upon a few simple precautions which are explained in the closing minutes of the film.

For further information, write The Texas Company, 135 East 42nd Street, New York 17, N.Y. • • •

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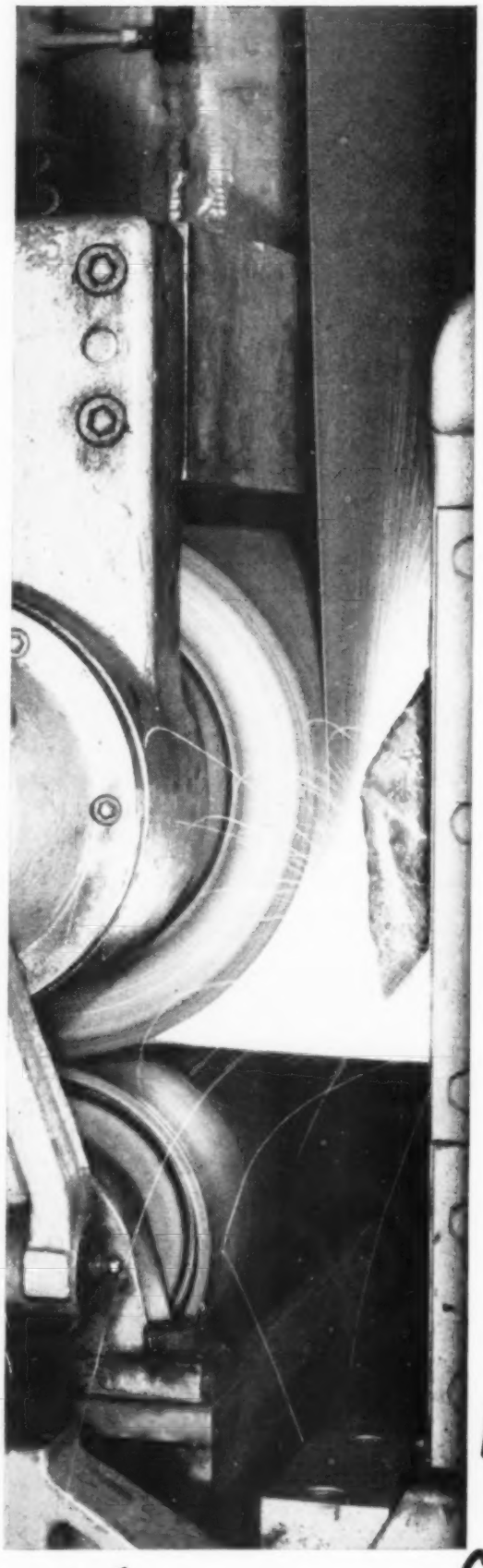

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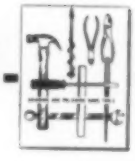

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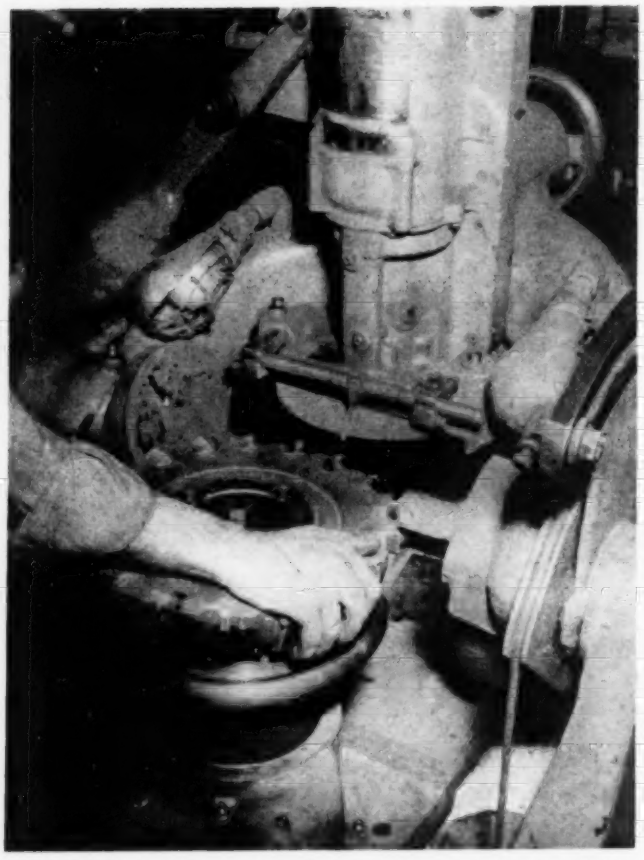

THE OLD WAY: Sharpening milling cutters on this tool grinder presented a constant hazard for the operator who was required to turn the cutter by hand to bring the various points into contact with the grinding wheel during the sharpening operation.

NEW METHOD: Hand wheel installed in the tool room now gives operator a hazard-free method of revolving the milling cutter and holding it in accurate relationship to the grinding wheel during the sharpening process. Simple tooling of this sort saves time, money, and injury.

GRINDING safely

by **Edmund Mottershead**

Necessity may be the mother of invention, but the man with the idea is certainly its father. Many shop men using grinders have, from time to time, devised holding fixtures, attachments, and other gadgets of one sort or another to speed the work, make for more accurate grinding, and safer operation.

Basic to all safe grinding, however, is the condition of the grinding wheel itself. Much of its condition depends upon how it is stored and handled before it ever reaches the grinding machine and is installed on the spindle.

Proper storage for grinding wheels must keep wheels dry, at more or less constant temperatures, and secured against rolling off the shelf. They must be protected from falling objects or from accidental bumps, cushioned by corrugated board or other material when piled one on top of another, and supported in storage in a way which keeps them free from any bending strains. These precautions, of course, are relatively more and more necessary as the size and weight of the wheels increase.

Wheels should not be stored on edge without some means of keeping them from rolling off the shelf or out of the bin. Never store thin wheels on edge as they may warp and become unsafe. Extremes of damp or heat or cold affect wheels through expansion and contraction and may cause cracks. Never pile heavy objects on top of wheels; treat them like any other fine tool which you expect to deliver good work for you.

Large flaring cup wheels should be stacked on a flat shelf, face to face and base to base in piles. Bins or boxes are best storage for internal wheels, cups, and other small wheels or points. Thin wheels with organic bond should be stacked flat on shelving.

Following these simple commonsense measures will reduce wheel breakage and accidents, increase wheel life and production.

• • •

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IF GRINDING WHEEL PROBLEMS HAVE YOU DOWN IN THE DUMPS, DON'T MONKEY AROUND. Switch to CINCINNATI (PD)° WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

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Lifting Device for Handling Large Grinding Wheels

PAWLING, N.Y.—A perennial problem of abrasive wheel manufacturers—damage to large, green or fired wheels during movement to and from kilns—may soon be a thing of the past, thanks to a new automatic lifting device developed by the Presray Corporation of Pawling, N.Y.

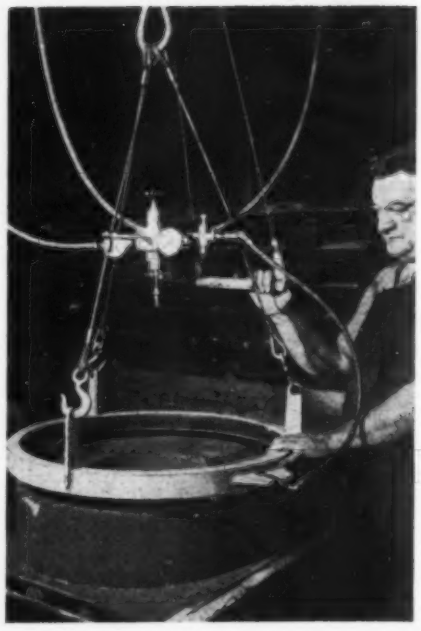
Called Pneuma-Grip by the firm, the device makes it possible for one man to lift green wheels up to 48 inches in diameter and weighing as much as 600 pounds—a task formerly done manually by 2 to 4 or more men, depending on the size of the wheel.

The main feature of this device is a machined steel ring lined with an air-operated rubber expansion "tire." When placed around an abrasive wheel and inflated, the broad surface of the tire grips the wheel firmly with equal pressure all around the circumference. This prevents unequal stresses which would damage unfired green wheels.

A central air control valve, a wire rope sling and a hardened steel link, from which the entire assembly is suspended, complete the unit.

To install this lifting device, a manufacturer needs only a mechanical or electrical hoist and an air supply line. The unit operates on 5 to 25 pounds air pressure and has an average strength/weight safety factor of 5 to 1 to insure safety.

The unit is suspended by a special link from a hoist. Movement of wheels is done with the hoist, the Pneuma-Grip merely holding them securely. The grip of the unit is such that it is possible to carry several fired wheels simultaneously by stacking one on top of another. This too, contributes to faster production rates.



HEAVY ABRASIVE WHEEL about to be picked up by newly developed Presray Pneuma-Grip. Simplicity of operation is demonstrated by operator. Device enables one man to handle large green or fired wheels. Task formerly required 2-4 men or more.

This unit can be used for wheels of many different sizes, merely by substituting a rubber-lined steel ring of the proper diameter. These are available from the firm. The air control unit works equally well with rings of any diameter. • • •

Over 1600 Showings of "Play It Safe"

More than 1,600 showings of "Play It Safe" have been made in safety meetings, new employee indoctrinations, safety associations, etc., in mills, foundries and shops across the nation, Peninsular Grinding Wheel Division, Detroit, announces. Technical societies and casualty insurance companies have also displayed a lively interest in this film. "Play It Safe" won several awards and commendations including the coveted Award of Merit at the Boston Film Festival in recognition of exceptional accomplishment in achievement of purpose.

The demand for "Play It Safe" is still running high. Arrangements for showings may be made by writing to Department "A," Peninsular Grinding Wheel Division, 729 Meldrum, Detroit 7, Michigan. • • •

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View of our experimental lapping laboratory showing some of the equipment available to test run your sample parts.

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Setting up the wheels shown at right is an easy job. The high capillarity of ALUNDUM polishing grains improves and speeds up the wetting process with glue or cement.

How polishing costs are being cut...NOW

Trend to wheels set up with ALUNDUM abrasive is spreading the money-saving "TOUCH OF GOLD"*

Many plants where polishing jobs are important find that a change-over to wheels set up with Norton ALUNDUM abrasives results in better, faster, lower-cost polishing.

In particular, preferences for S and R type grains are increasing rapidly. The S type, available in 14 to 90 grit sizes, is specially surface-treated to give the abrasive much greater adhesion to glue or cement. The R type, made in 100 to 240 grit sizes, also gets a special surface treatment, to improve its adhesiveness for use with glue only.

Typical advantages common to all ALUNDUM polishing grains include:

- **Uniform grain shape,** that assures a fast, uniform cutting action.
- **Uniform grain sizings,** with no oversize grains that mar the finish, no undersize grains to loaf on the job.
- **High capillarity,** assuring the easy absorption of adhesive that means longer lasting, better performing set-up wheels.

The booklet "Setting Up Metal Polishing Wheels and Belts" contains valuable facts on the various types of ALUNDUM grain . . . on the applications of canvas, leather or wooden wheels . . . and on the best means of preparing wheels, with cement or glue. Ask your Norton distributor for it. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

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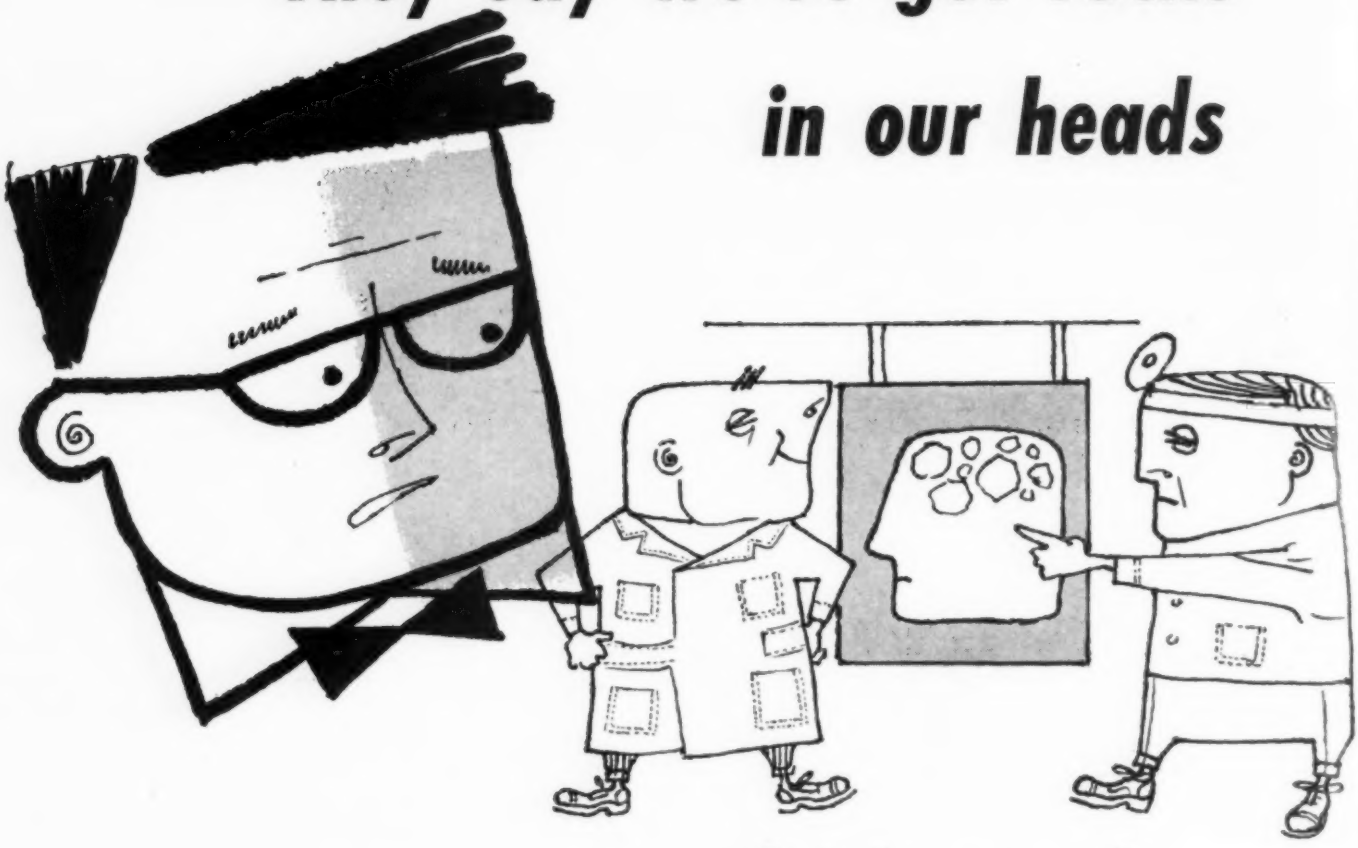
They say we've got rocks in our heads



—and it's true!

We really don't mind this sort of talk. It's our business to have the types of "rocks" on our minds that are saving millions of dollars in the finishing of manufactured parts.

Roto-Finish people have studied abrasive chips and compounds since the day they pioneered the idea of precision barrel finishing. The development of new and better media for specific finishing problems has made Roto-Finish the leader in mechanical finishing. Years of research and experience in barrel finishing techniques give Roto-Finish the "know-how" to recommend the right media to do the job you want done.

If you're not satisfied with your finishing production, look to Roto-Finish for the answer. Simply send samples of your unfinished parts, a finished part, a description of your production requirements and a list of the equipment you have available. We'll prove that you can save with Roto-Finish and we'll guarantee the same results in your plant that are achieved in sample processing.

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FOREIGN REPRESENTATIVES: CANADA — Toronto — Canadian Hansen & Van Winkle Co., Ltd., Cor. Silver and Morrow Aves. ENGLAND — Mark Road — Hemel Hempstead — Hertfordshire — Roto-Finish Ltd. AUSTRALIA — Cheltenham, 89 Tulip St., A. Flavell Ltd. HOLLAND — BELGIUM — LUXEMBURG — Delft, Holland — N.V. Roto-Finish Maatschappij Rotterdamseweg 370A ● AUSTRIA, GERMANY, SWITZERLAND, NORWAY, SWEDEN Frankfort a.M.—Metallgesellschaft A.G., Germany — Reuterweg 14 ● ITALY — Milan — Societa Roto-Finish a R.L. — Sestos S. Giovanni — Viale E. Marelli 31 ● FRANCE—Paris Societe Roto-Finish, 40-42 rue Chance Milly-Clichy, (Seine) ● BRAZIL — Rio de Janeiro — Commercial E. Industrial de Formas Werco, Ltda. rua General Gurjao, 326 ● SPAIN — Barcelona — Instituto Electroquimico, S.A. — Corcega 59.

Use postpaid card. Circle No. 234

Grinding and Finishing

Free Literature

Use the postpaid card opposite this page to receive your copy of any of the literature listed on these pages. Just circle the proper number on the card and mail it. We'll do the rest.

Steam Cleaners

A 4-page bulletin, describing the Mark series of three direct-fired Kelite Steam Cleaners, is being offered by Kelite Corp., 81 Industrial Rd., Berkeley Heights, N.J. In addition to illustrations of each model, the bulletin carries a table of specifications for each machine, as well as a list of specifications and optional features for all three steam cleaners.

Use postpaid card. Circle No. 1

Liquid Processing Equipment

A 39-page catalog of liquid processing equipment has been announced by Alsop Engineering Corp. Liquid processing equipment described includes filters, mixers, pumps, and tanks. The catalog shows installations and various applications. Cutaway views show the insides of the various equipment. Many helpful suggestions for improved performance are given.

Use postpaid card. Circle No. 2

Knife Grinding Machine

The Samuel C. Rodgers & Co., Inc., 2070 Sheridan Dr., Buffalo 23, N.Y., has announced Bulletin No. 300-1 which describes their Model 300 extra heavy duty knife grinder. Specifications are listed showing standard and optional equipment. Features of the machine are described in an editorial manner. The model is available in sizes ranging from 78″ to 300″ capacity.

Use postpaid card. Circle No. 3

Numerical Controls Explained

Pratt & Whitney Co., Inc., Charter Oak Blvd., West Hartford 1, Conn., has announced a booklet describing their Numerical Control; what it is; what it can do for you; the importance of basic accuracy; how the system works; hole location and the measuring system; and, finally, the system in operation. The system applies to grinding as well as jig boring machines.

Use postpaid card. Circle No. 4

Portable Grinder

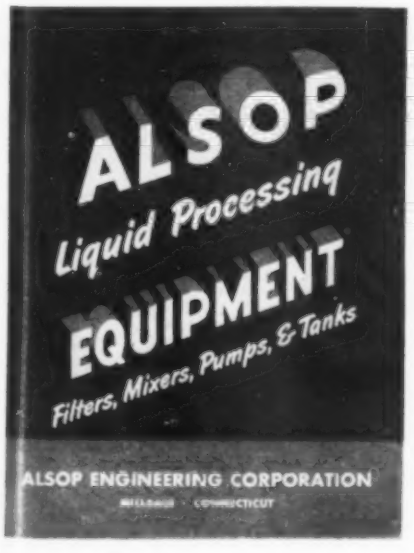
Bulletin NWSA 1030 from the Vee-Arc Corp., Westboro, Mass., describes their Model H 2-hp portable grinder. The unit uses 9″ disc wheels. Features of the portable grinder are described and a list of specifications is shown.

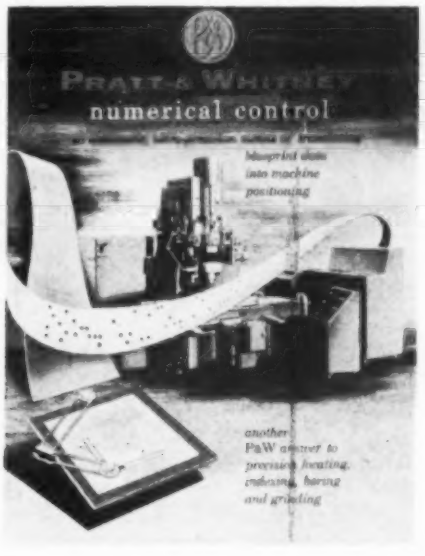
Use postpaid card. Circle No. 5

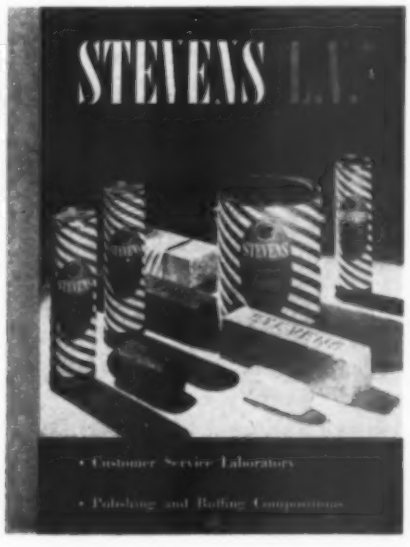
Polishing and Buffing Compounds

Recent developments in liquid and bar buffing and polishing compositions are featured in a revised 18-page data package from Frederick B. Stevens, Inc., 1800 Eighteenth St., Detroit 16, Mich. The data furnished in the bulletin lists recommendations for buffing, deburring and polishing different materials. Included in the recommendations are charts showing peripheral speeds of buffs, types of compositions to use on different surfaces of various materials applied by hand or machine. Products of the concern are cataloged separately.

Use postpaid card. Circle No. 6







FREE LITERATURE *continued*

Identification Code For Diamond Wheel Shapes

The American Standards Association approved the American Standard "Identification Code for Diamond Wheel Shapes" on March 7, 1957. Printed copies of this standard code have just been made available for distribution to industry by the Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio. Every shop should have a copy of this important code book because the coding system has been changed to enable every conceivable shape of *diamond* wheel to be typed by the use of the new set of symbols set forth in the code book. A great help when ordering new diamond wheels. Available on company letterhead.

Use postpaid card. Circle No. 7

Grinding Compound

International Refining & Mfg. Co., P.O. Box 468, Evanston, Ill., has announced a folder describing Excelus Micro Finish grinding compound. The announcement pointed out that the compound is not a synthetic.

Use postpaid card. Circle No. 8

Engineering and Mfg. Service

"Meet Associated Engineers, Inc." is the title of a brochure which outlines the complete engineering service to industry by Associated Engineers, Inc., 302 Silver St., Agawan, Mass. Included in the brochure is a description of the firm's six basic divisions of mechanical engineering, tool engineering, the industrial laboratory, the special services division (technical writing), the special products division and the manufacturing plant. Brochure available on company letterhead.

Use postpaid card. Circle No. 9

Surface Grinding Wheels

Simonds Worden White Co., 1101 Negley Pl., Dayton 7, Ohio has released a bulletin illustrating their complete line of surface grinding wheels. Complete listings of wheel dimensions and specifications are given. Several grinding suggestions are included.

Use postpaid card. Circle No. 10

Magnetic Chuck Control Units

Sundstrand Magnetic-Pneumatic Products Div., Sundstrand Machine Tool Co., 1020—9th St., Rockford, Ill., announces a bulletin describing their line of control units for 7-second demagnetization of low-voltage (24-volt d-c) magnetic chucks. Three types of control units in the Power-Grip line, designed for a broad range of applications, are described. Also described are the application of variable holding power features on two types and the use of extra power during demagnetizing cycle on the third type to overcome deeper than normal magnetic penetration. All physical dimensions, d-c outputs, and other information on 21 models of control units are listed.

Use postpaid card. Circle No. 11

Here's your spindle ready for reassembly. New super precision bearings from our complete stock of all types of spindle bearings are installed. We've cleaned and checked every part of this spindle for misalignment and flaws—It's ready to go back together for a series of exacting "run-in" tests to make certain the dirty, worn out spindle we received just hours ago is returned to you ready to perform as well or better than it did when the spindle was new!

Gentlemen:

I'd like to have complete information on your spindle repair service.

Name .....

Firm .....

Address .....

City..... Zone..... State.....

BEARINGS, INC.

3640 EUCLID AVENUE • CLEVELAND 15, OHIO

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Mansfield • Toledo • Youngstown • Zanesville

INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute

PENNSYLVANIA: Erie • Johnstown • Philadelphia • Pittsburgh • York

WEST VIRGINIA: Charleston • Huntington • Wheeling

NEW JERSEY: Camden • MARYLAND: Baltimore

DELAWARE: Wilmington •

Subsidiaries: Bearmet Corp. • Buffalo, N.Y. •

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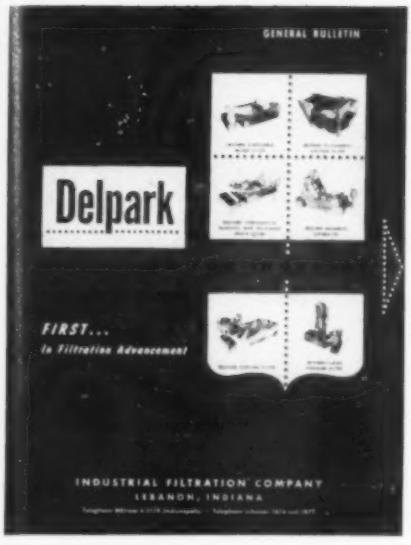
A NEW CONCEPT IN CONTROL UNITS FOR

SUNDSTRAND POWER-GRIP

Magnetic Chucks



Filter Guide

An 8-page brochure illustrating 6 major filter types for industrial application is available from Industrial Filtration Co., Dept. GB-495, Lebanon, Ind. Delpark filters offered include disposable media gravity type, combination gravity and magnetic, straight magnetic, vacuum, pressure and screen-type settling filters. Complete descriptions of filter operation are given as well as applications, degree of filtration and flow rate capacities.

Use postpaid card. Circle No. 12

Hard Facing

Metal & Thermit Corporation offers a new 20-page booklet about a new line of Murex Hardex hard surfacing electrodes. The electrodes best suited to hundreds of different hard surfacing applications are charted in the booklet. Important information is also furnished on how to decrease porosity, cracking, penetration and weld metal dilution with these low hydrogen electrodes. Electrodes are engineered to improve wear characteristics under severe service conditions.

Metal & Thermit Corp., Rahway, N.J.

Use postpaid card. Circle No. 13

Low-Cost Finishing Barrel

The Handee Slide-Abrader is described in a new flyer offered by Chicago Wheel & Mfg. Co. A small finishing barrel suitable for deburring, radiing and finishing of small parts in the screw machine, machine shop, die casting and stamping departments, the barrel is 13 inches in diameter and is self-contained with a ¼ hp motor. Low first cost ($168.50) enables the unit to pay for itself in 15 runs, according to the manufacturer.

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.

Use postpaid card. Circle No. 14

Single Point Tool Grinders

Tool grinders for single point tools are shown in literature from Thomas Prosser & Son, Felter Bldg., Tenafly, N.J. The machines feature a Hager reciprocating-action tool holder to permit rocking the tool by hand across the entire face of the wheel in addition to many other features designed to simplify tool sharpening operations. The machines come in bench, floor and wet type models.

Use postpaid card. Circle No. 15

HANCHETT
METAL SAW SHARPENER

for HOT or COLD CIRCULAR SAWS
Solid or Inserted Tooth Types

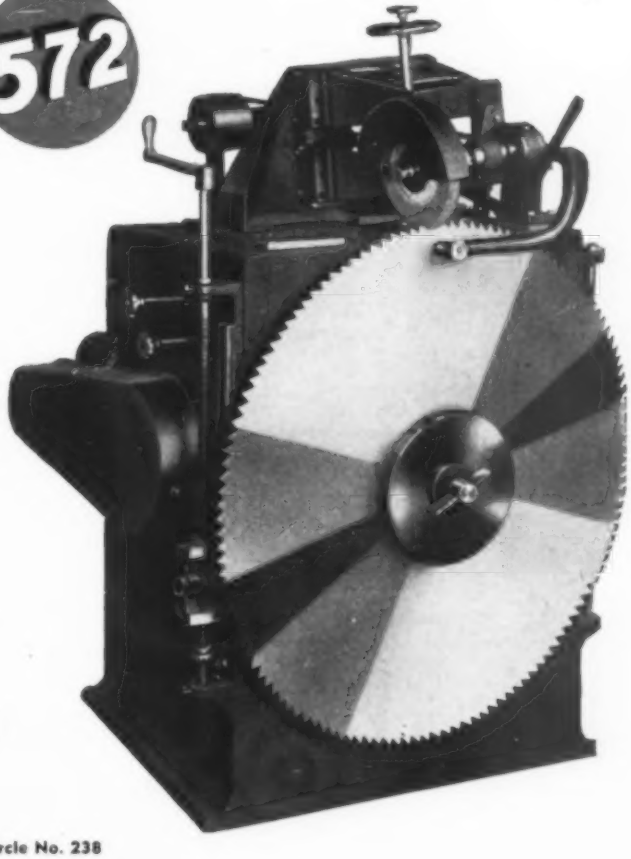
HEAVY DUTY — BALANCED DESIGN

Straight Line Grinding Wheel Feed Action — Smooth and Accurate

Wheel Head Adjustable for any Saw Tooth Angle Desired (Cam Action)

- Grinding wheel speed is adjustable for wheel wear
- 100% anti friction bearings for smooth, trouble-free operation
- Accurate—simple stroke adjustment for both feed and lift cams
- Rugged construction for hard, heavy duty performance
- Heaviest stock removal at high production rate
- Grinding wheel head motor—two h.p. (belted type)
- Capacity—24" to 72" diameter saws (larger when required)
- Available—other sizes and types of machines to meet all saw requirements

MODEL 572



HANCHETT MANUFACTURING COMPANY

World's Largest Manufacturers of Saw Sharpening and Knife Grinding Machinery

MAIN OFFICE: BIG RAPIDS, MICHIGAN

WEST COAST: PORTLAND 1, OREGON

Use postpaid card. Circle No. 238

FREE LITERATURE *continued*

Equipment Catalog

Martindale Electric Co., Box 617, Hird Ave., Cleveland 7, Ohio announces their catalog No. 31 which describes 110 different products for safety, maintenance and production. The catalog includes complete information for selecting and ordering metal-working tools, motor and generator maintenance equipment, flexible shaft machines, safety equipment, and other electrical and mechanical maintenance products. Also included in the 64-page catalog are: rotary burs and files, metal-cutting saws, mica undercutters, field coil testers, growlers, test instruments, portable blowers, face shields, dust masks, and similar items.

Use postpaid card. Circle No. 16

Ground Flat Stock

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa., announces the availability of a new catalog covering its Invaro and Airvan grades of ground flat stock. Thicknesses, widths, and prices are given. Data on typical analysis, hardening, and quenching and tempering of the two steels is included along with tempering graphs.

Use postpaid card. Circle No. 17

Steel Tubing Applications

Ohio Seamless Tube Div. of Copperweld Steel Co., Shelby, Ohio has released a twelve page booklet depicting some of the many uses of seamless and electric resistance steel tubing in materials handling equipment. Of interest to design engineers and others in metal-working plants, the content is suggestive of similar steel tube applications in many other fields.

Use postpaid card. Circle No. 18

Finishing Stainless Steel

R. G. Haskins Co., 2651 W. Harrison St., Chicago 12, Ill., announces an 18-page manual-catalog on stainless steel finishing operations. Of particular interest is the explanation of the requirements peculiar to stainless steel finishing and how they are best met. The correct approach to actual finishing is presented in the order of the severity of the operations themselves. Thus, are grinding, sanding, the satin finishes obtained by using string wheels, polishing and buffing. An equipment section lists the recommended equipment for the above operations with specifications. Information dealing with stainless steel that every operator should know is included in a section entitled "Some Tips for Better Finishing."

Use postpaid card. Circle No. 19

Precision Investment Castings

Special summer program at the Massachusetts Institute of Technology to be held September 9-13 is described in bulletin. Purpose of the program is to increase metallurgical knowledge of investment casting and to consider new developments. Sales potential of this industry is $200 million in the near future. Program will include lectures, laboratory exercises and demonstration.

Massachusetts Institute of Technology, Cambridge 39, Mass.

Use postpaid card. Circle No. 20

High-Temperature Alloys

Physical properties, applications and shape availability of four Westinghouse wrought high-temperature alloys are listed in a new booklet. It includes Discaloy, K42B, Refractaloy 26, and Refractaloy 70 alloys. The various Westinghouse facilities for hot forging, cold forming, machining, welding and heat treatment of these alloys are also described.

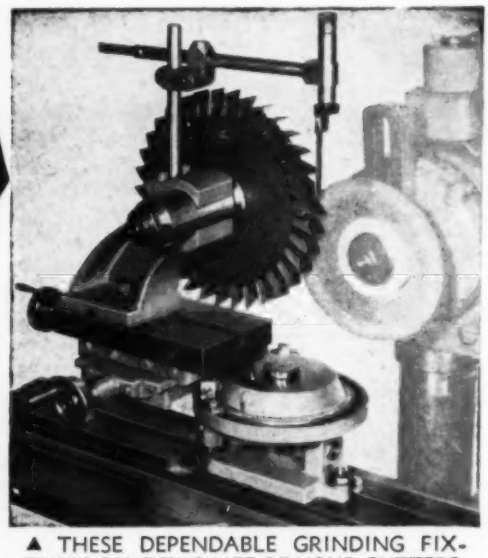
Westinghouse Electric Corporation, P.O. Box 2099, Pittsburgh 30, Pa.

Use postpaid card. Circle No. 21

THE UNIVERSAL RADIAL CUTTER GRINDING FIXTURE

Does 5 Operations without removing cutter from its ARBOR!

On cutters up to 8" in diameter, the No. 6 fixture, as shown with our No. 6A heavy-duty, right-angle, ballbearing spindle workhead:
Sharpens side teeth on **both** sides.
Sharpens peripheral teeth.
Generates small or large radii on **both** corners of each tooth.
(Other workheads available)

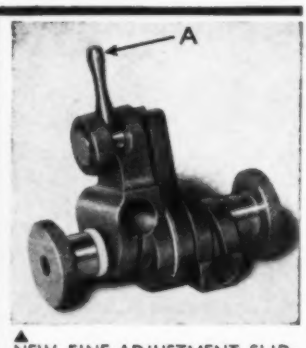


▲ THESE DEPENDABLE GRINDING FIXTURES SAVE THE LIFE OF YOUR CUTTERS. Write for our catalog 603

◀ UNIT 1A
This Universal Cutter Grinding Fixture fits any universal tool or surface grinder.

Radial Grinding Attachment D combines with Unit 1A for sharpening end mills with square, conical, or ball nose shapes. ▼

▲ UNIT 4A
Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.



▲ NEW FINE-ADJUSTMENT SLIDING SWIVEL GIVES SMOOTH, PRECISE INDICATOR SETTING. Smooth, positive positioning of finest dial indicator is readily accomplished by the fine-adjustment Sliding Swivel. Final precise positioning is accurately made by slight movement of convenient lever "A".
WRITE FOR:
SLIDING SWIVEL FOLDER

ROCHELEAU TOOL & DIE CO.
650 North Main St., Leominster 1, Mass.

Use postpaid card. Circle No. 239

Pipe and Tube Cutting

Circular describes the Wallace Rotary Cutting Unit, an abrasive cutoff machine with large diameter capacity for cutting off pipe or tube up to 24 inches diameter. Claimed cutting speed of the unit: 20-inch pipe, ⅜ wall - 2 minutes. Finish is said to be of "gasket-face" quality. There is power to everything except the handle which controls pressure on the cutting head. Carriages with self-centering jaws move on rails to hold long work parts. Variable speed drive rotates the part during the cut.

Wallace Supplies Mfg. Co., 1300 Diversey Parkway, Chicago 14, Ill.

Use postpaid card. Circle No. 22

Safety Equipment Guide

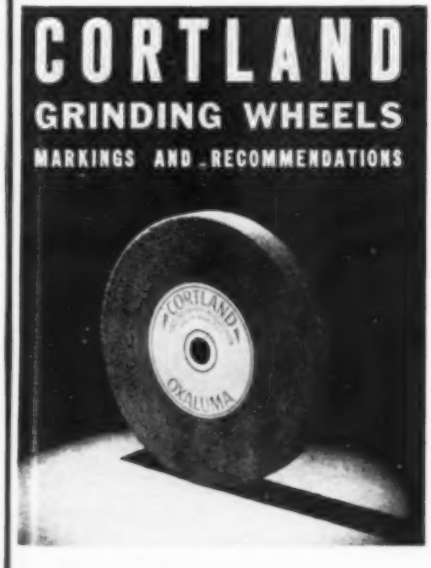
Catalog 10 has been announced by the General Scientific Equipment Co., 7516 Limekiln Pike, Philadelphia 50, Pa. The catalog presents the company's entire line of safety equipment, including all types of protective equipment from a small half-ounce dust mask to a large barrel lifter. Equipment is grouped according to its function so that the user can select items best suited to his needs. General specifications and recommended uses are given for each item.

Use postpaid card. Circle No. 23

Grinding Wheel Recommendations

A 37-page booklet on grinding wheel markings and recommendations is available from the Cortland Grinding Wheels Corp., Chester, Mass. The booklet opens with an explanation of the symbols used for marking the wheels. This section is followed with many helpful explanations of what factors influence the choice of proper wheel. The passages on general recommendations list the material and operation, point or wheel marking, abrasive and bond. The booklet concludes with a list of general operating rules.

Use postpaid card. Circle No. 24



There is a difference

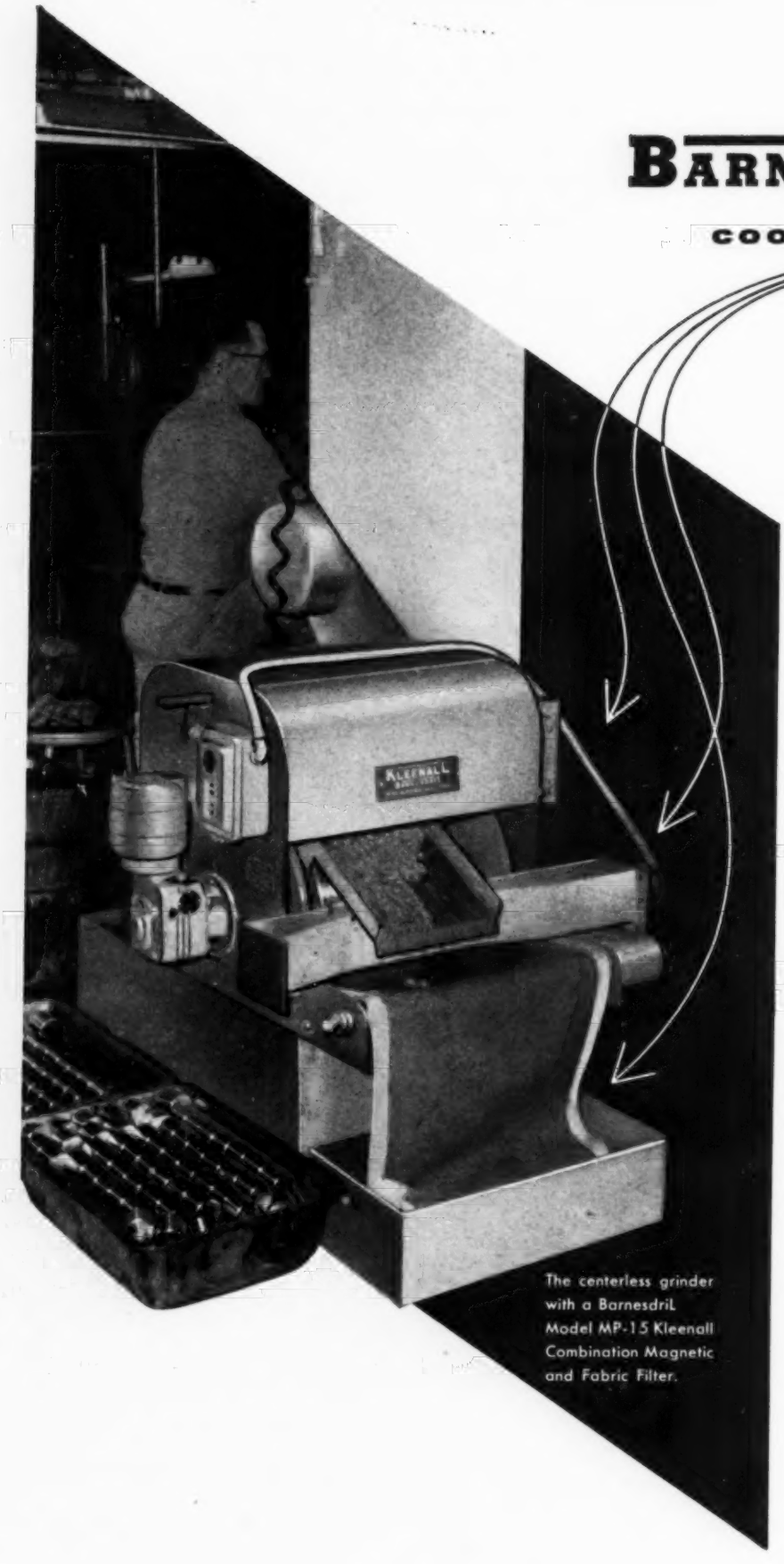
Regardless of your abrasive needs—coated abrasives, grinding wheels, honing stones, abrasive grain—Mid-West, with its modern facilities, vigorous research and development and trained abrasive engineers is your one sure source for complete satisfaction.

and progressive thinking makes the difference

MID-WEST QUALITY ABRASIVES

MID-WEST ABRASIVE CO.
510 S. Washington St., Owosso, Mich.

Use postpaid card. Circle No. 240



The centerless grinder with a BarnesdriL Model MP-15 Kleenall Combination Magnetic and Fabric Filter.

BARNESDRIL

coolant filters

provide competitive quality advantage

"Savings are secondary to the quality control we have gained in the use of BarnesdriL Kleenall Filters. The Filters have allowed us to keep ahead of our competition in the quality of our product."

This statement was made by the plant superintendent of a prominent roller bearing manufacturer. A centerless grinder (shown) and a super finisher are used for surface finishing and bringing bearings to their final accuracies. Both are equipped with BarnesdriL Kleenall Combination Magnetic and Fabric Coolant Filters. The bearings, used in guided missiles, aviation electrical motors, and transportation equipment, are finished to 2 to 3 RMS micro-inches. Size must be held to ±.000025", and their crowns held to .00001", checked by electronic measuring device.

By filtering the recirculated coolant through Kleenall Filters, definite production savings are also accrued. Less coolant and less labor are required and equipment lasts longer. If quality control or extreme accuracies are part of your production requirements, consult a BarnesdriL Engineer about the advantages of Kleenall Filters.

50th year

FILTRATION DIVISION

BARNES DRILL CO.

886 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road

Use postpaid card. Circle No. 241

Grinding and Finishing

New Equipment and Materials

For further information on any of the products listed here, use the handy postpaid card opposite page 64.

Grinding 100% More Springs Per Hour At 1/3 Less Cost

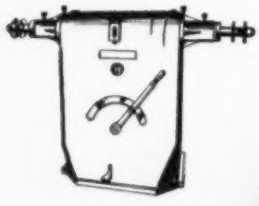
● Since many types of industrial springs, in the sizes from 1" to 2½" in diameter and from 1" to 3" long, have to be ground flat on the ends for more precise performance, a leading Midwestern manufacturer prefers to supply their springs ground, ready for use.

After years of testing, first with single disc grinders and then with improvised, but highly ingenious, harnessed and paired single grinders, the engineering department hit upon the idea of having a double, or tandem, machine developed to do their heavy grinding chores. The production engineer posed the problem to this grinding machine manufacturer, offering his research and experimental work as help and proof that such a machine was practical. The challenge was accepted by the manufacturer.

After much cooperative work between the respective engineering staffs, a tandem special grinder was produced as the answer to these spring grinding problems. It employs the use of two pairs of grinding discs, diametrically opposed, separately powered and driven. A feedwheel moves pieces to be ground between each pair of discs

TWO AND ONE HALF INCH long tractor valve springs made of .187 wire are fed to hopper from chute and easily placed in holders on the feedwheel of the tandem special grinder. Alterations in feedwheel design can be made to accommodate different workpieces.

BUFFERS—
Direct, Belt, gear, vari-speed



GRINDERS . . . BUFFERS

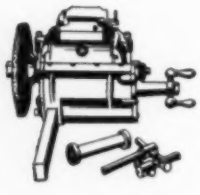
These superb electrical grinders and buffers . . . 1/3 to 40 hp . . . set the pace for highest quality and efficiency . . . and for amazing savings in cost and maintenance. Preferred by industry everywhere!

ATTRACTIVELY PRICED

United States Electrical Tools

Over 60 years of Service to Industry

GRINDERS—
Lathe, tool post, angle plate, vertical spindle



GRINDERS . . .

Direct, gear, belt drive, swing frame, vari-speed single or dual motor, portable, bench, angle plate, die, wet, disc and snagging grinders; combination grinder and buffer.

BUFFERS

Direct, belt, gear, vari-speed buffers.

United States Electrical Tools are electrically and mechanically correct.

ALL ROTATING PARTS AND SPINDLES ARE PRECISION-BALANCED DYNAMICALLY BY LATEST ELECTRONIC EQUIPMENT

WRITE FOR CATALOGS

The United States Electrical Tool Co.
3640 LLEWELLYN ST., CINCINNATI 23, OHIO

Use postpaid card. Circle No. 242

in succession in one revolution. In other words, this machine roughs and finish grinds in one controlled operation. The first pair of heads carry roughing discs for removing metal. The second pair grind to desired finish and tolerance. How efficiently this grinder performs for the spring maker can be realized from these results.

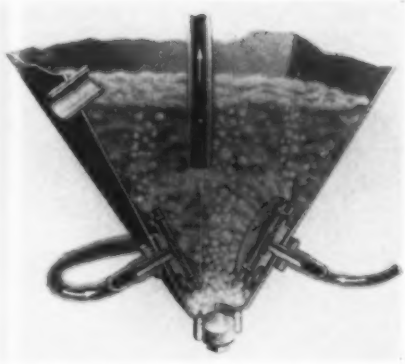
Since installation, a year and a half ago, production on the spring grinding operation has doubled, costs were cut one-third and one operator now does the job with less fatigue whereas two were required before.

In the grinding cycle, springs are fed into a hopper from an overhead chute. They are then placed into specially-designed flat holders, the holes and thickness of which vary in size according to diameter and length of the springs. As the feedwheel rotates, the first pair of 30" solid abrasive discs rough grind both ends of the springs at once, removing .100" of material. Further along, in the same rotation, a second pair of 30" solid abrasive discs finish grind to a tolerance of 45 lbs. ± 2¼ lbs., removing .030" of material. A total of .130" of material is removed in one pass through the machine. Springs automatically unload into boxes through an opening at the end of one complete feedwheel revolution. Roller conveyors carry full boxes on to the next operation of shot peening.

A special feature of this grinder is the orbital grinding action produced by an eccentric type feedwheel (patent applied for). A combined oscillating and rotating motion causes the work to travel in a wave-like pattern across the face of the discs. This process exposes many more abrasive cutting edges and produces more efficient grinding. Longer disc life and less frequent dressing result, according to the manufacturer.

This spring maker finds that the tandem special grinder requires very little maintenance and gives a lower unit production cost, a higher production rate and more uniform products. It is the No. 918-30 tandem special grinder made by Besly. For further information on this and other grinders, write to the Besly-Welles Corp., South Beloit, Ill. • • •

Use postpaid card. Circle No. 101



Typical installation of Pangborn Sluriator units.

Unit Keeps Abrasive Slurry Properly Mixed

The problem of keeping fine abrasives thoroughly slurried in water for die and mold cleaning, deburring, maintenance cleaning, and other finishing operations with Hydro-Finish equipment has been solved by engineers of the Pangborn Corporation, Hagerstown, Md. Designed to prevent the solid packing of abrasive at the bottom of the tank after overnight shutdown, a new Sluriator eliminates the need for a mechanical pump and auxiliary equipment and can be adapted to conical-bottom tanks by means of a conversion kit. Drawings, instructions, fittings and materials are available to convert any Pangborn Hydro-Finish cleaning unit to the improved technique.

The Sluriator consists of a 4-inch diameter compressed air distributor set between two heavy gage Wear-Resist alloy circular plates. Two such fittings are installed at the base of the sloping side walls of the abrasive slurry tank as illustrated in Figure 1, so that the agitating air strongly sweeps the tank bottom as well as spirals through the body of the liquid to provide rapid and thorough agitation of the slurry.

The only equipment required to supply the new Sluriator is a take-off from the regular 80 to 90-lb. compressed air line necessary to operate the nozzle, and a needle valve to regulate the air flow through the Sluriator heads at 6 to 10 cfm.

Simple air injection through a central bubbler port at the bottom of the tank has proven too localized in its stirring action to maintain uniform slurries and overcome hard packs which settle out at the corners of the tank bottom after long periods of shutdown. The common solution of the problem is to build an auxiliary side tank and circulate the slurry through it under the positive drive of a vane-type pump. This involves costly equipment design.

Pangborn Corp., Hagerstown, Md. •

Use postpaid card. Circle No. 102

Cyclone Collector has Drum Connections

Large volumes of bulky dust can be effectively trapped from the air by Torit Manufacturing Company's 219-FB-55 dust collector, the largest cyclone separator unit in the Torit line, which has recently been fitted with connections to standard 55-gallon drums.

This cyclone collector is intended for use with machinery that creates great quantities of sawdust particles and/or shavings. Centrifugal force precipitates all but the very finest particles into the drum. An automatic air-tight sealing feature on the drum cover eliminates the need for clamps, and the drums can be changed in 30 seconds.

Torit Mfg. Co., 287 Walnut St., St. Paul 2, Minn. •

Use postpaid card. Circle No. 103

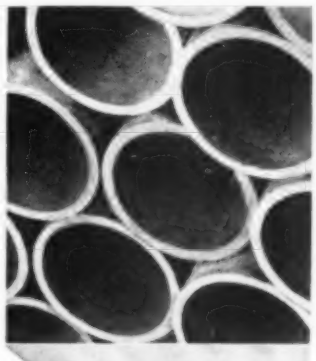
Torit collector with drum connections.

Campbell
Abrasive Cutting Machines

Abrasive Cutting Know-How

Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation

For Thin-Wall or Heavy-Wall Tube Cutting You Can IMPROVE QUALITY and PRODUCTION...CUT COSTS with Any One of Several Models of Campbell Machines



• You can confidently expect the sort of tube-cutting performance pictured here when a CAMPBELL Abrasive Cutting Engineer prescribes the CAMPBELL Machine Model best suited to cut YOUR costs.

QUALITY CUTS • No burn...absolute minimum burr to reduce or eliminate deburring operations ...no distortion of tubing.

FAST CUTS • Wet cuts, for highest quality, at the rate of 6 to 10 seconds per square inch of metal...dry cuts at 2 to 5 seconds per square inch.

PRODUCTION • Operation of CAMPBELL Models ranges from manual or semi-automatic, to fully automatic for highest production rates.

VERSATILITY • CAMPBELL Abrasive Cutting Machines handle a wide range of shapes...channels, angles, solid rounds or squares...as well as tubing.

CAPACITY • There are 13 CAMPBELL Machine Models plus "specials." To fit your needs eleven of the "standard" machines provide tube-cutting capacities up to 14" O.D.

FOR EXAMPLE • The CAMPBELL Model #28 Severall is a low-priced, general utility, dry-cut machine. It cuts at the rate of 2 to 5 seconds per square inch of metal...will handle tubing up to 6" O.D., solids to 4", 6" angle iron and 8" channels.

This CAMPBELL Machine Model #223 cut the tubing pictured above. It handles up to 3½" tubing, 2" solids. Work clamps, work stop and coolant flow operate automatically.

CAMPBELL rotary machines cut tubing or solids up to 14" diameter with exceptional accuracy and wheel economy.

For further information write for the illustrated Bulletin DH-460-B

ACCO

CAMPBELL MACHINE DIVISION • American Chain & Cable

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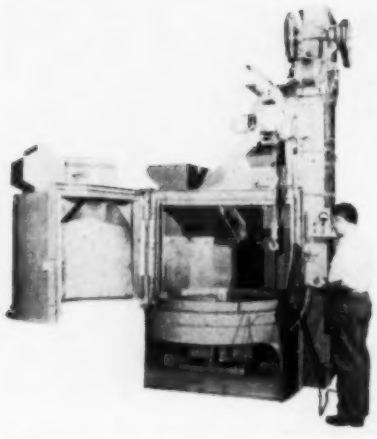

Pangborn blast table.

Small Blast Cleaning Table Introduced by Pangborn

Pangborn Corporation have introduced a small 4-ft. Rotoblast table room for cleaning all types of work in foundries and plants that require a small machine. Castings, forgings and stampings up to 48" diameter x 24" high, as well as plastic and composition materials, can be blasted in the unit.

New table is equipped with a cast labyrinth abrasive sealing system which makes the cabinet abrasive tight without rubber gaskets. For loading, a single door opens to expose half of the 48 in. diameter rotating work table.

A single overhead Rotoblast wheel, powered by a 10 hp motor, will throw 15,000 lb. of abrasive per hour. An optional 15 hp motor is available that will throw 22,000 lb. of abrasive per hour. A self-contained automatic elevator and separator continuously clean used abrasive for recirculation to the blast wheel.

Pangborn Corp., Hagerstown, Md. •

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LOW-COST CONTOUR AND SURFACE PROJECTOR called the "Magnaviso" is manufactured by American Optical, Instrument Division, Buffalo. Unit is suited for inspection and examination of relatively flat objects and small parts, imprinted circuits, fine print of small scale drawings and like applications. Small objects or flat materials to be examined are placed on two-way movable platform. Counter-balanced optical head is lowered into contact and magnified image is projected onto 4½" x 12" viewing screen. Price $110.00. American Optical, Instrument Div., Buffalo 15, N.Y.

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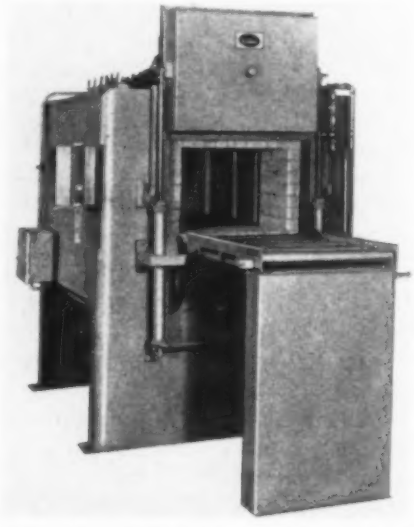

FOR CONTROLLED-ATMOSPHERE TREATING—Eclipse "in-and-out" controlled-atmosphere tempering or drawing unit has a maximum operating temperature of 1400°F. Note three alloy radiant tubes inside furnace, a total of six are used (three per side) for even heat distribution. Unit is supplied completely packaged for quick, simple installation. Eclipse Fuel Engineering Co., Rockford, Ill.

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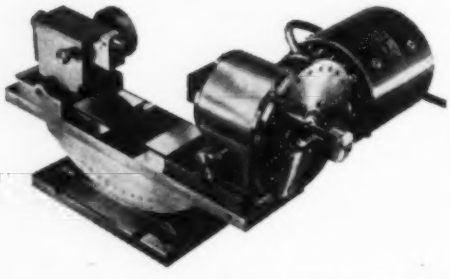
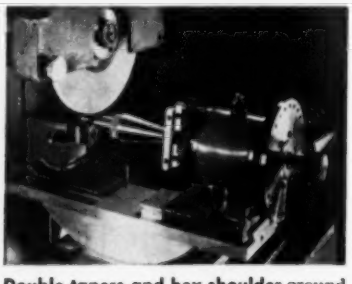
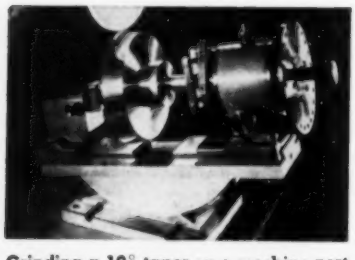
Save on small grinding jobs with Moore Motorized Centers

Toolroom attachment for surface grinders, jig borers, drill presses, millers, etc., handles flat, curved or circular work in one setting.

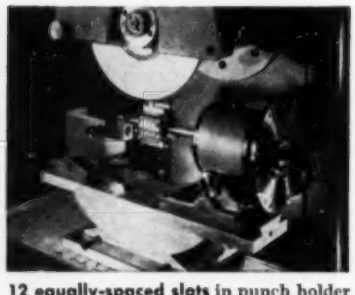




Double tapers and hex shoulder ground with a single setup.



Grinding a 10° taper on a machine part 5" long, 5" in diameter on centers.



12 equally-spaced slots in punch holder ground by using index plate.

You no longer need to tie up large machines on grinding square and round punches ... doing taper grinding, index grinding and face-plate work. Moore Motorized Centers, a portable, precision-built accessory, can be set on a surface grinder chuck in a jiffy and the job completed quicker than the grinding wheel on a large machine can be changed. You'll save on toolroom labor and materials.

With Motorized Centers, in one setting, you can grind flat, curved or circular work—in any combination of taper or contour—all within .0005". The index plate allows indexing in the same operation, too. Tapers can be reversed or changed by loosening two screws in the rocking bed, and the index plate can be engaged by merely pressing a plunger. The simple tail-stock center readily permits the use of specials—male, female or cutaway.

Catalog with 20 Action Photos shows many toolroom jobs you can handle with this versatile tool. Write for a copy today.

SPECIFICATIONS	
Length—overall	12"
Width—including motor	10"
Height—overall	8"
Distance between centers—maximum	6"
Centers will swing	6"
Max. grinding angle (using 10° angle block)	30°
Motor	1/25 H.P., 115 volt, 60 cycle
Work Speeds	110-220-440 R.P.M.

Moore Special Tool Company, Inc.

725 Union Avenue, Bridgeport 7, Conn.

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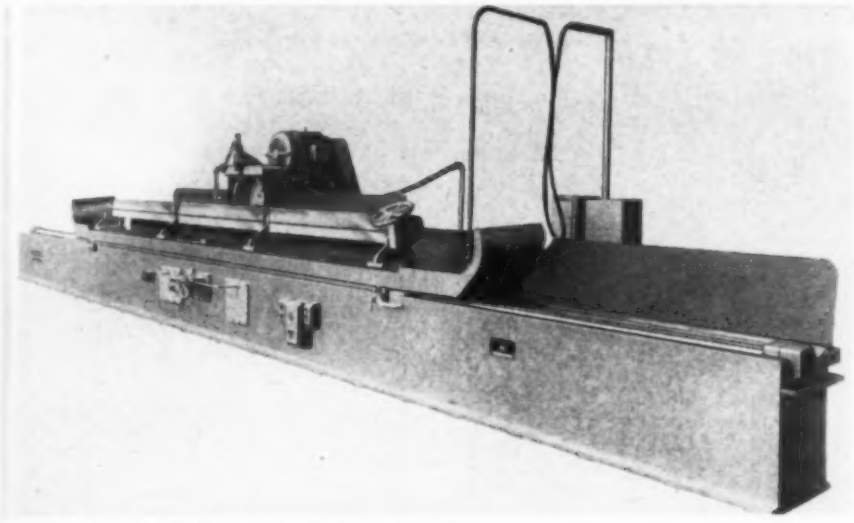
Heavy Duty Knife Grinder



Rogers Model 300 heavy duty knife grinder.

Shown here is a Model 300 extra heavy duty traveling type knife grinder of 240″ capacity, equipped with a magnetic knife bar. This model is available in sizes ranging from 78″ to 300″ capacity, with weights ranging from 13,500 lb. to 42,500 lb. The carriage travels in self-aligning ground ways consisting of one V-way and one flat way. The V-way absorbs any forward thrust, permitting the heaviest cuts at high speed. Machine is equally suited to light grinding.

The grinding head unit features an extra heavy, totally enclosed spindle. Spindle shaft is equipped with preloaded ball bearings, eliminating end thrust or side movement to assure grinding accuracy at all times. The chuck mounted, 26″ dia. segmental grinding wheel provides cool and maximum cutting action and is belt driven by a 25 hp TEFC BB (or larger) heavy duty motor. Grinding head unit is adjustable to permit concave or flat bevel edge grinding. Wheel dresser is mounted on head. The head is equipped with a heavy wheel guard.

The hydraulic table drive operates at low, variable pressure using two opposing drive-rod type formica lined cylinders, eliminating the use of pistons. The drive-rods serving as pistons are fully supported and guided inside the cylinders to assure smooth operation. Formica bearings also support the drive-rods when extended from the cylinders. Speeds are variable up to 100 fpm. Faster speeds are available to order.

Swiveling knife bar has four finished sides complete with knife or shear mounting slots. The 360° swivel permits grinding to any bevel required. Standard size is 8″ x 8″, but larger sizes, as well as magnetic knife bars, are available, the manufacturer states.

An automatic and adjustable force lubricating system assures an even flow of oil to the bed at all times, decreasing bearing wear and increasing machine life. The wet grinding system provides an adequate flow of coolant to the work, with a maximum flow of 60 gpm at the grinding head. Although completely automatic, the infeed may also be hand operated. The automatic infeed is adjustable in increments of .00025″ to .003″ at each end of the table stroke.

Samuel C. Rogers & Co., Inc., Buffalo, N.Y.

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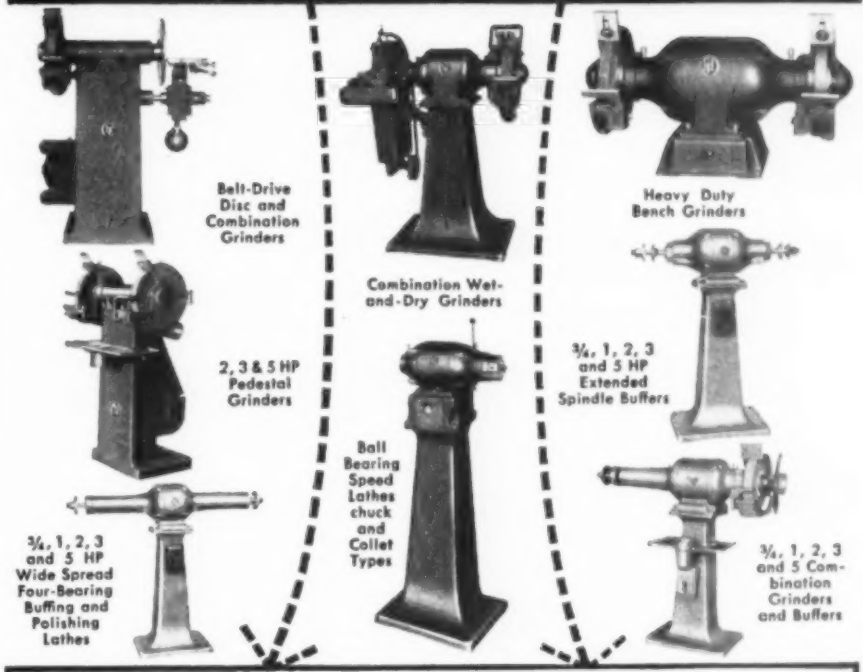
Belt-Drive Disc and Combination Grinders
Heavy Duty Bench Grinders
Combination Wet-and-Dry Grinders
2, 3 & 5 HP Pedestal Grinders
¾, 1, 2, 3 and 5 HP Extended Spindle Buffers
Ball Bearing Speed Lathes chuck and Collet Types
¾, 1, 2, 3 and 5 HP Wide Spread Four-Bearing Buffing and Polishing Lathes
¾, 1, 2, 3 and 5 Combination Grinders and Buffers

PRICE is an attractive feature in the famous CINCINNATI general purpose buffers and grinders, supplied in a variety of capacities and designs since 1902.

QUALITY, however, has never been sacrificed in the production of these buffers and grinders. We sincerely believe the Cincinnati line is America's top dollar value!

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Makers of a complete line of pedestal and bench grinders and buffers, speed lathes, dust collectors and cut-off machines.

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Superfinisher has Polyester Panels

Fiberglass reinforced Plaskon polyester is used for protective panels and covers of the Gisholt Masterline Model 52A general superfinisher. The plastic's light weight simplifies routine maintenance requiring removal of the panels. Other advantages of polyester for this application include its strength, corrosion resistance and sound-deadening characteristics.

Gisholt Machine Co., 1245 E. Washington Ave., Madison, Wis.

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CLEVELAND GRINDING MACHINE
1660 Eddy Road, Cleveland 12, Ohio

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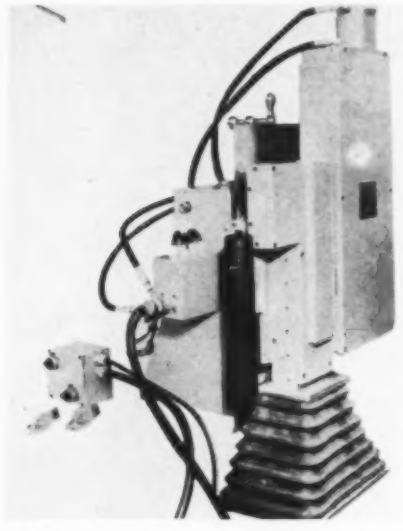

Wheel Dresser for Cylindrical Grinders

Hydraulic contour wheel dresser Model 86, for use on cylindrical grinders, features dressing diamonds optically set in the microscope fixture so that no dresser adjustments are necessary when changing diamonds.

Dresser will handle profile widths up to 6" and profile depths up to 3½". Hydraulically operated, it may be tied directly into the grinding cycle for fully automatic operation. Where applicable, uniform peripheral diamond dressing speed is possible.

Hoglund Engineering & Mfg. Co., 343 Snyder Ave., Berkeley Hts., N.J.

Use postpaid card. Circle No. 109

Crystals, Wafers Lapped to Critical Flatness

The Lapmaster Division of Crane Packing Co., Morton Grove, Ill., has introduced a new technique for obtaining critical flatness and parallelism in the production of germanium, silicon, quartz, barium titanate and lead zirconate crystals and wafers. A lapping operation on a Lapmaster, in combination with the new Lapmaster diamond fixture, can produce a flatness under three light bands, a parallelism of 50 micro-inches and a thinness of .001" on these crystals or wafers.

In the first side operation, the crystals

Diamond fixture and Lapmaster.

or wafers are lapped with little or no fixturing on a standard machine. In this operation, they are lapped to approximately two light bands (23.2 millionths of an inch).

In the second side operation, the blanks are affixed to a specially designed diamond fixture for finish lapping. This triangular steel plate, lapped to a flatness of two light bands, has adjustable diamond stop points at each leg to limit the travel of the fixture in the lapping cycle. The diamond stops can be set to microinch accuracy to provide the desired crystal blank finish thickness. The diamond points, being resistant to aluminum oxide abrasive, act as positive stops, thus predetermining the lapping operation to the limit set within the range of the abrasive's particle size.

Crane Packing Co., Dept. GFN, 6400 Oakton St., Morton Grove, Ill.

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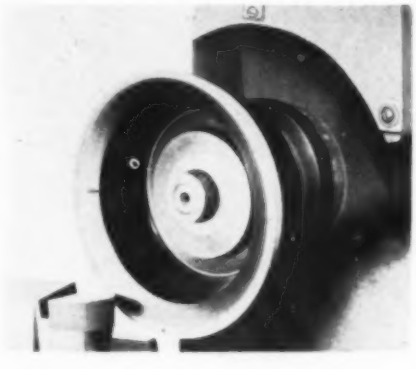

New Resin Bond Cup Claims Higher Production, Lower Cost

An improved D11B resin bond diamond impregnated flaring cup is now being manufactured for dry grinding applications of carbide single point and multi-tooth tools. A new bond, B-60, is said to be reducing costs on all applications of carbide, regardless of size or grade. New methods can be practiced in grinding carbide tools due to its ability to take larger amounts of stock on each single pass. Single passes of .005 dry are now accepted on multi-tooth cutters where in the past .0005 to .001 was recommended. Larger single passes for each blade ground offers higher production on grinding applications.

On most large cutters, the B-60 flaring cup will grind completely around a full cutter and return to the number one blade still touching. This not only offers a true ground tool, but also provides longer life. A new back has been incorporated along with the bond for easier dressing when clearing the diamond section.

Sharp corners are easy to attain. Although larger feeds can be taken with the bond, there is no chipping along the periphery.

Wheel has proven satisfactory where coolant facilities are available on tool and cutter grinders and plunge grinding is desired. The manufacturer, A.I.T. Diamond Tool Co., Skokie, Ill., claims it to be capable of offering the user success in most applications.

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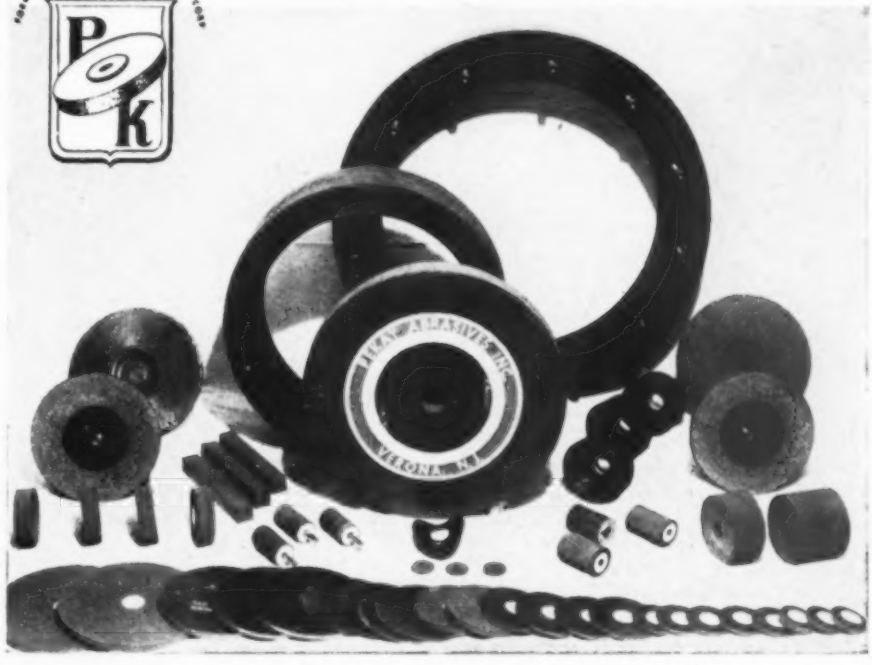

Are you grinding with 1957 model grinding wheels or just letting the old "metal burner" do?

Let us show you what real wheel development is. For example, a flexible rubber bonded wheel that operates safely at 16,000 f.p.m.

Let Pekay show you the way.

Send For Complete Information.

PEKAY ABRASIVES, INC.
271 GROVE AVENUE VERONA, NEW JERSEY
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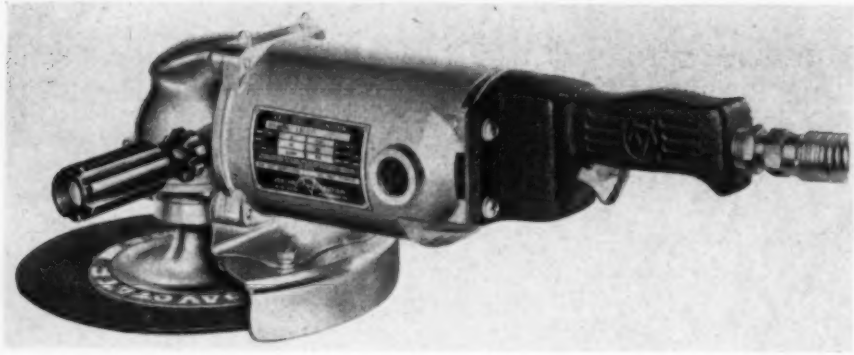
Portable Grinder Has Extra Power



This portable grinder weighs 14 lb and is well balanced for easy handling. May be used with 9" disc wheels or 7" cup wheels.

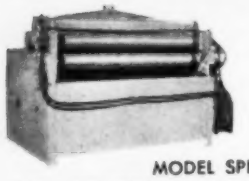
Motor is 2 hp, 115 v, ac/dc. Only 60% of its power is required for normal operation, leaving an ample reserve for tougher jobs.

Other features include ball bearings throughout; vital parts lubricated and dust-sealed; all parts rust and corrosion resistant; no load speed 5300 rpm.

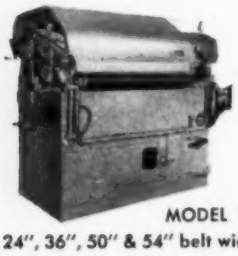
Vee-Arc Corp., Dept. VA-8, Westboro, Mass.

Use postpaid card. Circle No. 112

TIMESAVER SPEEDBELT* ABRASIVE MACHINES



MODEL SPL
24", 36" & 50" belt widths



MODEL TOP
24", 36", 50" & 54" belt widths

Both Models of the Timesaver "Speedbelt" Abrasive Machine can be used in tandem for automatic polishing of tops and bottoms of material being processed . . . in one operation.

Mechanize polishing of aluminum, stainless steel and other metal sheets, bars and blanks — perforated or solid

TIMESAVER *SPEEDBELT* Abrasive Machines are the fastest and easiest machines to set-up for production polishing schedules on the market today. Abrasive belts with grit range from 40 to 220 can be changed in 5 minutes or less. Adjustment for stock thickness can be made in seconds. Feed speed is variable from 35 to 80 SFM with lower or higher speeds optional In addition to polishing, Timesaver Machines are used for metal finishing and deburring operations.

Write Today . . . send for the on-the-job story of Timesaver Machines polishing metal grilles and folder describing in detail all the Timesaver features, construction and specifications.

TIMESAVER SANDERS

P.O. BOX 7446 • ROBBINSDALE STATION
MINNEAPOLIS 22, MINNESOTA

See at Metal Show, Chicago, Ill., Booth No. 1342, Nov. 4-8

Use postpaid card. Circle No. 248

SPRAY-COOLER, a low-cost portable cooling system for metalworking machines, directs a finely atomized spray of coolant at the point of cutting. Of corrosion resistant stainless steel construction, the unit is designed to prolong tool life from 50 to 500%. By removing heat almost instantaneously it results in finer finishes, sharper tools and permits greatly increased operating speeds. Available at $37.50 from leading mill supply houses. Triple-E Engineering Co., Racine, Wis.

Use postpaid card. Circle No. 113

PEAR CUTTER GRINDER is offered in this country by Aaron Machinery Co. Model 3/ZN universal type shown is complete with ¼ hp motor. Unit can be used to grind taper shank cutters. Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N.Y.

Use postpaid card. Circle No. 114

Grinder Gives Correct Gauge Thickness, Good Surface Finish in Single Pass

The Model 456 pinch roll belt grinder is said to be capable of providing outstanding surface finishes while grinding titanium, stainless steel, or carbon steel flat stock to precise gauge thickness in a single pass. Four machine sizes are available, providing capacities of 36, 48, 60, and 72 inches. Feed roll speeds are fully adjustable from one to 100 fpm to meet a variety of operating requirements. Finishes obtained are of such quality that the need for most hand-finishing operations is eliminated.

Belt drive and idling mechanism provide for belt travel over four rolls designed in a diamond shape. This arrangement, together with the exceptionally long (20-ft., 3-in.) belt, provides improved flexing and chip removal, plus allowing the belt to remain cool and free-cutting during long periods of operation.

Belt adjustment is through the top idler roll, that can be adjusted vertically for correct tension and cambered for belt alignment. Roll is cambered automatically to produce the proper action of belt across work.

An attachment for spraying coolant or lubricant on either the abrasive belt or work is available. This can be arranged for manual or automatic operation.

The new machine is designed for handling both polishing and stock-removal jobs. Where there is no need for holding thickness or parallelism, the billy roll floats against the sheet. But for positive stock removal and holding size, two air-controlled dashpots move exactly parallel to the contact roll. Thus, the grinder can be used to reduce rolling mill gauge tolerances. Test runs indicate thickness can be held within .0015 in. on many jobs.

Photoelectric cell control of the grinding aperture can be provided as an optional feature where final surface finish is particularly important. The sheet passing through the feed rolls interrupts the light beam of a photoelectric cell circuit. This actuates the control mechanism, that is timed to raise the billy roll and bring the sheet into contact with the abrasive belt. Contact is established when the lead end of the sheet passes ¼ inch beyond the center of the contact roll. The process is repeated, in reverse, when the trailing edge of the sheet moves out of the path of the light beam.

Size of the main drive motor ranges from 40 to 150 hp, depending on machine size. All operating controls are located at the front of the machine within easy reach of the operator.

Mattison Machine Works, Rockford, Ill.

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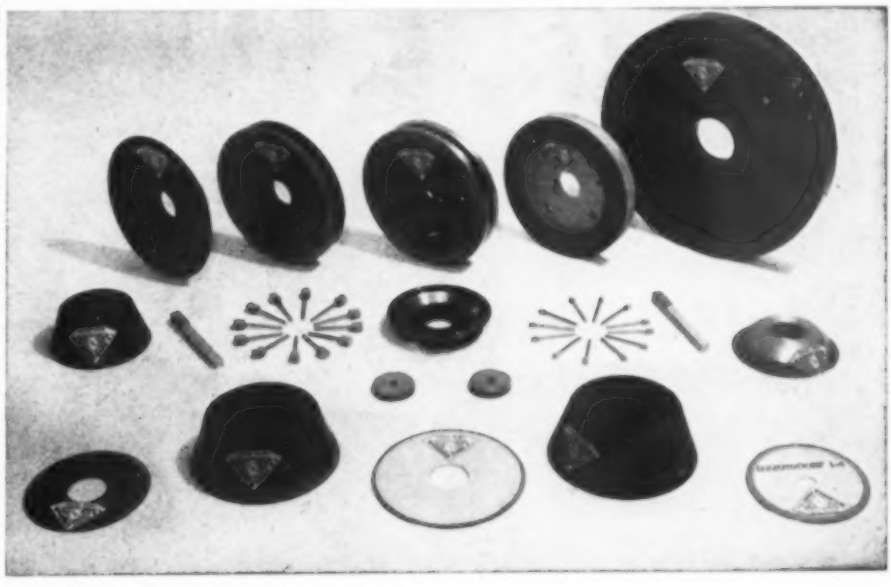

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271-279 GROVE AVE., VERONA, N. J

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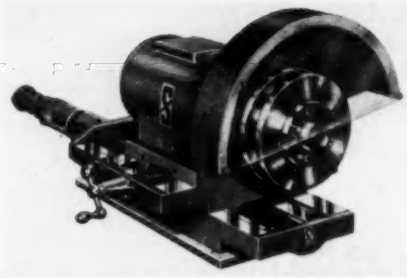

Components Convert Machine to High Production Unit

An available basic machine can be converted to a modern high production unit or a special-purpose installation through the simple and proper selection of a work head, a motorized spindle for grinding, milling, boring, etc., along with a suitable slide or feed.

The unit illustrated represented a conversion on an existing steel mill roll grinder. The operation involved grinding of the 6 in. to 14 in. dia. journal on a roll 3 ft. to 4 ft. in diameter x 12 ft. to 14 ft. long. The basic machine incorporated a swivel for positioning of the illustrated assembly at the proper angle for also grinding the taper on the journal.

Truly a "building-block" unit, this assembly consists of a 7½ hp, 1800 rpm motorized spindle with taper nose to accommodate a balancing type of wheel holder for the 20" dia. resinoid bond wheel; a structural plate steel wheel guard to protect the grinding wheel; a cross feed for positioning and also to compensate for wheel wear; an hydraulically controlled air cylinder assembled on the feed with non-metallic ways for traversing the grinding wheel the length of the journal. Each is a catalog item.

Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, Ohio.

Use postpaid card. Circle No. 116

Flat Lapping Machine has Push Button Operation Frictional Drive

A new, larger size Spitfire lapping machine, the Gyro-Matic 24, combines automatic push button operation with frictional drive work retainer rings. It has a 24-inch dia. anti-distortion lapping plate and is designed for production line precision lapping and finishing of all types of flat parts. Each of three work holder rings accommodate piece parts up to 9¾" dia. The frictional drive parts retainer rings retain and guide work while conditioning lapping plate during cycle.

Although the machine has kept some features of the Gyro-Matic 21, such as push-button operation and J.I.C. electrical controls, several innovations have been added. An aperture metering disc eliminates the possibility of grit build-up around the abrasive control outlet. Depending on the individual lapping or finishing job at hand, an operator adjusts the metering disc to the outlet size required, and a steady stream of abrasive compound flows through. Coupled with the abrasive agitator paddle, abrasive suspension is said to be always correct.

Model 24 is constructed with a circular work area. When lapping operation is completed, piece parts are merely slid from lapping surface directly to circular work area. Quantity unloading takes only seconds.

Spitfire Tool and Machine Co., 2931 N. Pulaski Rd., Chicago 41, Ill.

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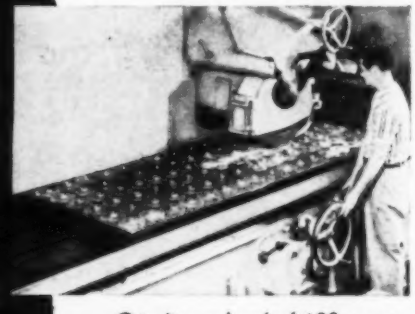
For Holding

SMALL

MEDIUM or

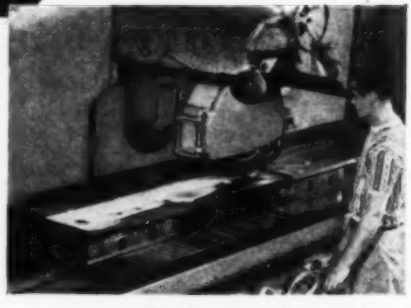
LARGE PARTS



Grinding a load of 102 gears.

Use Sundstrand Magnetic Chucks

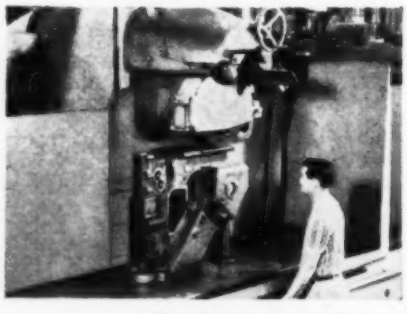
Here's another interesting application of magnetic holding applied to a surface grinder. The deep penetrating power of the Sundstrand magnetic chucks makes it possible to hold a great number of small parts or large castings. In all cases setup is simplified and clamping time is greatly reduced.
Whether you have tool room, production, or special holding problems, look into the possibilities of eliminating expensive clamping and increasing production with Sundstrand Magnetic Chucks.



Grinding four slide castings.

Get All the Facts

Write for complete information on these time saving magnetic chucks. Ask for bulletin 384M.



Grinding drill press frame

SUNDSTRAND

POWER-GRIP

SUNDSTRAND

Magnetic - Pneumatic Products

Division of Sundstrand Machine Tool Co.

1020-9th ST. • ROCKFORD, ILLINOIS

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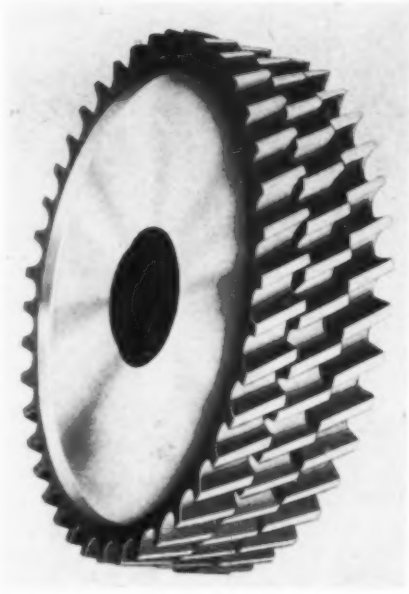

Rubber Contact Wheel Has Deep Grooves

Many difficult metal grinding and finishing operations may be simplified with the R-58 rubber contact wheel. It shapes itself to the contours of the object that is being ground. Because of its exceptionally deep serrations the new wheel will even conform to such difficult shapes as boat propellers, intricate automobile hardware, and many types of household utensils. It reduces grinding and finishing time because it hugs the contours; a greater area is contacted with each pass.

Wheels are all one inch in width and are available in hardnesses or durometers. Color coded, they can be combined for any width or hardness combination that may be necessary. When two or more of the wheels are used together they leave no pattern on the work. The lands overlap to give a smooth grinding action. When one edge starts to wear the wheels can continue to be used effectively simply by reversing them on the shaft.

Chicago Rubber Co., Inc., Waukegan, Ill.

Use postpaid card. Circle No. 118

AIRETOOL'S MODEL 700-V. Used for cup wheel grinding, sanding, wire wheel work.

Three-Way Pneumatic Grinder

This vertical pneumatic grinder can be used for cup wheel grinding, sanding, or wire wheel work. Airetool's Model 700-V, with its 6″ cup wheel, wire brush, or flexible sanding disc, takes down rough spots or does overall grinding on flat or curved surfaces. Equipped with two handles, it is easy for the operator to maneuver the grinder and keep it under control in any position and at any speed.

Grinder weighs only 11 lb. and is balanced to grind evenly and smoothly with little added pressure at speeds from 4500 to 6000 rpm. A thumb button control makes it simple to adjust the grinding speed quickly. A wide variety of large cutting surface wheels, sanding and polishing attachments are available for this tool.

Airetool Mfg. Co., Springfield, O.

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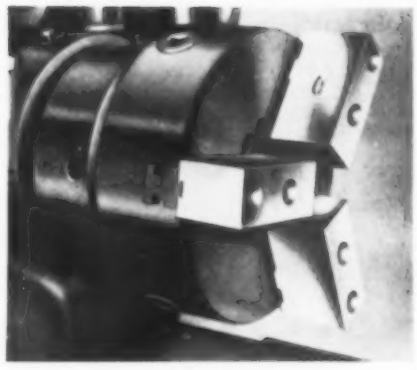

NEW LINE OF STANDARD CHUCK JAW BLANKS are being mass-produced to fit approximately 90% of all master chucks, including Bullard, Cushman, Warner and Swasey, Horton, Skinner, and Union. Can be used on most machine tool builders' chucks, including Goss and Deleeuw, Acme, New Britain. Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, Ohio.

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NEW...

LOW...

only 2 7/8″ high!

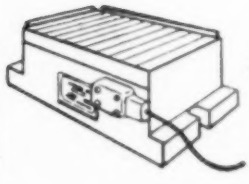
MAGNA-LOCK model L ELECTROMAGNETIC CHUCKS

7 SIZES TO CHOOSE FROM

5″ x 10″
6″ x 12″
6″ x 18″
8″ x 18″
8″ x 24″
10″ x 15″
10″ x 16″

Now — more working height under the grinding wheel plus the advantages of Magna-Lock fine pole laminated top — 22% more holding area, work pieces held to extreme edges of top — famous Magna-Lock holding power.

Here's new cost-cutting chucking for your tool room and your production machining operations. Get the full details *now*. Write Dept. GF-107



Hanchett MAGNA-LOCK CORPORATION

BIG RAPIDS, MICHIGAN, U.S.A.

designers and makers of a complete line of magnetic chucks and devices.

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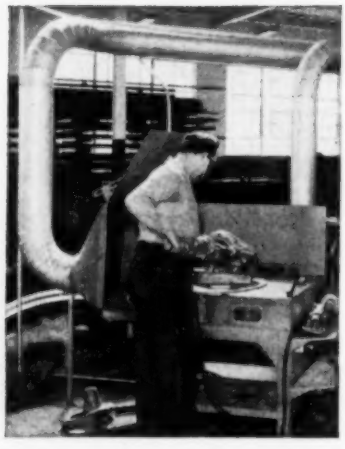
AIR IN MOTION KEEPS MEN IN MOTION

Dusty or fume-laden air can curtail production and increase maintenance costs by dulling worker efficiency and damaging bearings, motors . . . even machines.

Efficient K & B Dust Control Systems put AIR in Motion to become an important production tool.

In the plant of a noted chain and forging firm, an official made this comment about a new K & B installation: "Our workmen can now work full time . . . this means added production for them and for the company as well."

Call on K & B engineers to put *AIR in Motion* and help boost your plant efficiency. The Kirk & Blum Manufacturing Company, 3124 Forrer Street, Cincinnati 9, Ohio



K & B system serving castings grinding removes dust, sand and chips as fast as they are produced. Work revolves on turntable to enable operator to work continuously.

50 YEARS OF SERVICE

KIRK & BLUM

DUST CONTROL

K & B Down Draft Dust Control System in plant of The Monarch Machine Tool Co., Sidney, Ohio

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BRITISH-MADE WRIGHT SURFACE GRINDERS are available in this country through Air Transport Equipment, Inc., Amityville, N.Y., exclusive U. S. agents. Entire line, ranging in size from 8" to 20" in diameter, is available with variety of accessories and attachments.

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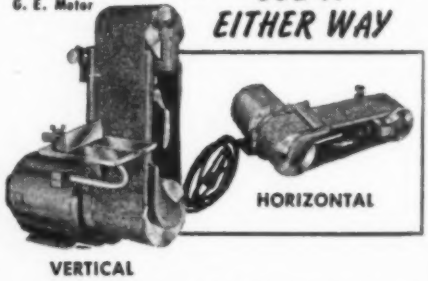
Please Mention GRINDING and FINISHING when writing to Advertisers

WALLS TU-WAY BELT SANDER

Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY



VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION

333 Nassau Avenue Brooklyn 22, N. Y.

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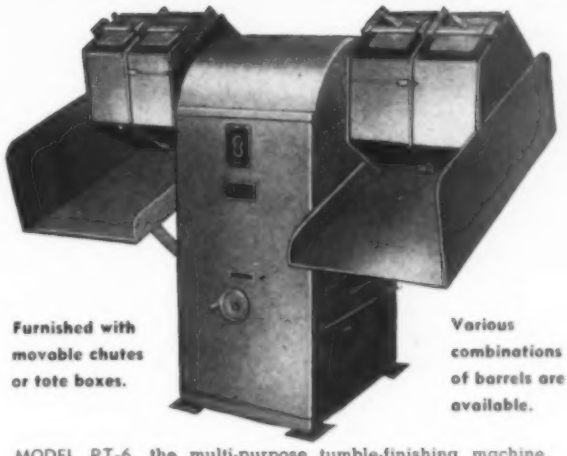
Free Reprints Available from Grinding and Finishing

Reprints of articles published in this magazine are available at no charge. Write GRINDING and FINISHING Magazine, 222 E. Willow, Wheaton, Illinois.

1. How to Reduce Snagging Costs by Proper Wheel Testing, WYBORSKI, Peninsular Grinding Wheel Co.
2. Where and How You Can Use Abrasive Tools, MCADAMS AND ERICKSON, American Abrasive Products.
3. Work Holders and Drivers, CONN., Scully-Jones and Co.
4. Proper Mounting of Wheels.
5. Grinding Army M-48 Tank Hulls With Special Grinders, BUNNIN AND SATTERBLOM, Blaw-Knox Co.
6. Grinding and Finishing in Chrysler's Torque Flite Transmission Plant, KENYON.
7. How Precision Steel Balls Are Ground and Finished, WEIR, Carborundum Co.
8. Lubrication or Cooling?
9. Finish Measuring Techniques, BOLLES, Micrometrical Mfg. Co.
10. When and How You Can Use Crush Form Grinding, CHILDERS, DoAll Co.

NEW MULTI-BARREL FINISHER
handles many small loads



Furnished with movable chutes or tote boxes.

Various combinations of barrels are available.

MODEL RT-6, the multi-purpose tumble-finishing machine, solves the problem of increasing load capacity without adding separate machines. It handles large or small loads, of one part or a wide variety. It can be furnished with regular-size or smaller barrels . . . for 2, 3 or 4 compartment operation. The RT-6, as illustrated, has four 5-gallon barrels, with Variable Speed Drive from 12 to 36 RPM. Other features include a ½-HP motor, 220/440 volts 3-phase, a watertight switch and magnetic starter.

FULL DETAILS are given in new Rampe Catalog. Write for your copy today.

RAMPE MANUFACTURING CO.
14917 WOODWORTH AVE., CLEVELAND 10, OHIO

BARREL FINISHERS • SCREEN SEPARATORS • COMPOUNDS • NYLASLUGS

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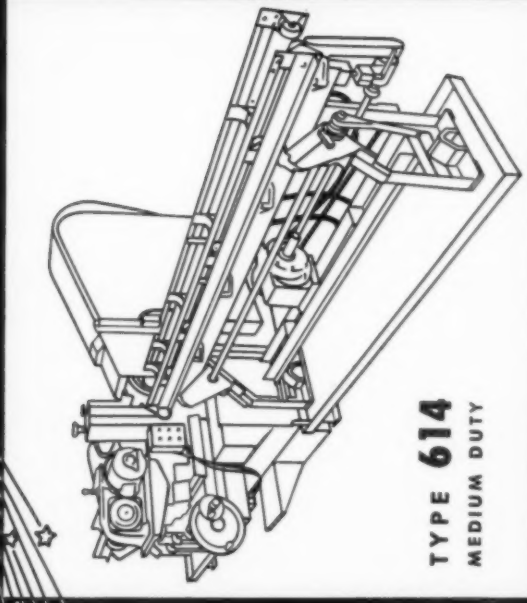
Production CENTERLESS GRINDING & FINISHING MACHINE



TYPE 614 MEDIUM DUTY

Remove stock faster at less cost . . .

Production's 614 Machine combines belt method of centerless grinding and finishing with exclusive reverse traverse to provide the fastest, lowest cost means of stock removal.

This medium duty machine has a capacity from ½" to 4" diameters on bar or tubular stock. Set up can be changed from heavy stock removal to low microinch finishing in minutes. Supporting and feeding fixtures are available for long lengths and various weight capacities.

Our Demonstration Laboratory is ready to process a sample lot of your parts or stock. Write for details.

PRODUCTION MACHINE CO., Greenfield, Mass., U.S.A.

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Announcing

the New!

B900 Series K. O. LEE GRINDERS

Model B960
Universal Grinder
SHOWN WITH B943 MOTOR-DRIVEN WORK HEAD AVAILABLE AT EXTRA COST

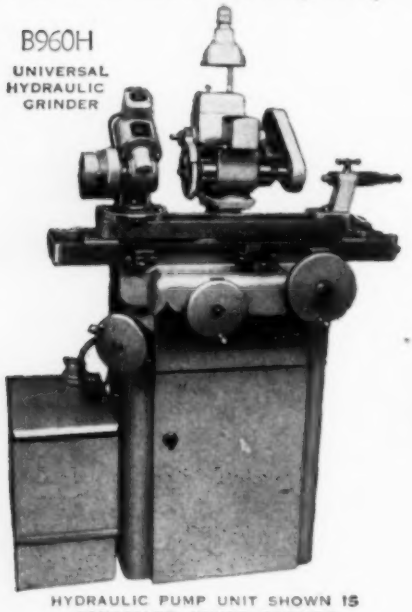
The new Lee grinders have improved accuracy standards, greater capacities, 25% heavier construction, V-type Saddle, larger table ways, improved lubrication system giving longer life, and many refinements for easy operation. New engineering features simplify and minimize time in making setups for almost every operation.

Available Models

B900 Tool & Cutter Grinder
B900X Basic Tool Grinder
B960 Universal Tool Grinder

K. O. Lee Company Offers a Complete Line of Grinder Fixtures

B960H
UNIVERSAL HYDRAULIC GRINDER



HYDRAULIC PUMP UNIT SHOWN IS CONCEALED INSIDE CABINET

The K. O. Lee Company makes available a large selection of fixtures adaptable to the B900 series grinders. Partial list includes: Motor Driven Work Heads, Tap Grinding Fixtures, Tilt Table Attachments for forming and sharpening cemented carbide tools, High Speed Grinding Attachment, Radial Grinding Fixtures, Universal Work Holding Fixtures, Sensitive Work Heads, Diamond Dressers, and Cutter and Hob Grinding Arbors.

HYDRAULIC POWER UNIT

For Table Traverse Available on all

LEE B900 SERIES GRINDERS

Hydraulic Pump Unit Shown Is Concealed In Base Cabinet

CLIP AD TO LETTERHEAD
AND SEND FOR COMPLETE LITERATURE

K. O. LEE COMPANY, ABERDEEN, SO. DAKOTA

"The new B900 series K. O. Lee grinders will be on display at the National Metal Exposition, Chicago, Booth 1397, November 4-8, 1957."

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News of Industry

Sheffield Acquires Interest In British Gage and Tool Firm

A major interest in M.P.J. Gauge & Tool Co., Ltd., Birmingham, England, producers of special high-precision fixed gauging equipment and dial indicator instruments, has been acquired by The Sheffield Corp., Dayton, O., a subsidiary of Bendix Aviation Corp.

Immediate expansion of the M.P.J. plant facilities is scheduled under a program which eventually will enable the British company to manufacture and sell all Sheffield products in the English market. Initially, production will include products of Sheffield's standard production instruments division. These include a varied group of Precisionaire gaging units adapted for use in the automotive, appliance, aircraft and guided missile fields.

Soaking-Pit Furnaces Fired

Allegheny Ludlum Steel Corp. has increased the soaking-pit capacity of its Brackenridge, Pa., Works with the start-up of two batteries of four new soaking-pit furnaces each of advanced design. The gas-fired furnaces are housed in a new, 10,000 sq. ft. building.

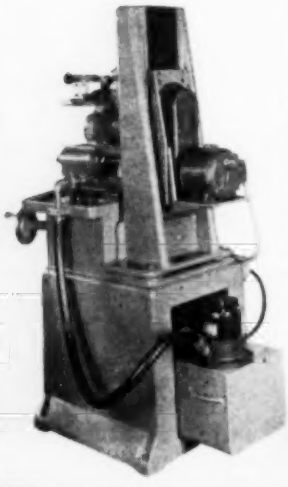
Soaking pits are refractory-lined furnaces designed to hold steel ingots for several hours, reheating them to carefully controlled temperatures for rolling into desired shapes. Electrically operated doors atop each of the pits roll back to allow a giant crane to place ingots in the pits and remove them once they have soaked up sufficient heat. A bin arrangement below the pits allows removal of scale and ash from the heating chambers with a minimum of handling.

DALZEN

THREAD GRINDER

- AVERAGE SET-UP TIME 30 MINUTES!
- SAVES FLOOR SPACE!
- LOW COST!

Excellent for tool room and production Thread Grinding. Easily set-up from job to job! Has built-in relieving attachment as standard equipment for grinding of taps. This remarkable machine may also be used to grind angles, grooves and surfaces where concentricity is an important factor!



Dresser and wheel head are self-compensating. Size of work is automatically maintained after dressing of wheel regardless of how much is dressed off.

The grinding and regrinding of thread rolls up to 3" in diameter and thread milling cutters can also be ground with special attachment.

Photo shows just a few of the many jobs done on the DALZEN THREAD GRINDER.

2 in 1 COMBINATION CENTER GRINDER & DRILL PRESS

A drill press and center lapping machine at less than the cost of many single purpose center grinders! In addition to savings on equipment costs, the Dalzen "2 in 1" permits maximum man-hour production thereby keeping your unit cost at a minimum!

1 SIMPLE OPERATION CHANGES CENTER GRINDER TO DRILL PRESS

Center grinder to drill press or drill press to center grinder in a matter of seconds! Simply unlock clamping handle and swing diamond dresser in or out of position! Photo at right shows center grinder at work.

A full 43" capacity from base to spindle . . . dresser adjustment from 20° to 100° included angle . . . drills to center of 15" circle . . . maximum lapping stone dia. 3".

WE ALSO SPECIALIZE IN
THREAD ROLLING DIES AND THREAD HOBS
LITERATURE ON REQUEST

DALZEN MANUFACTURING CO.
4600 BREE ROAD DEPT. GF-10
ST. CLAIR, MICHIGAN

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MacDermid Opens West Coast Division

C. E. Weekly

MacDermid Inc., Waterbury, Conn., and Detroit, Mich., manufacturer of metal cleaning, plating and finishing chemicals, recently opened a West coast division, MacDermid Pacific Inc.

Complete manufacturing, warehousing, sales and service facilities are now in operation. The new division, headed by **Claude E. Weekly,** former product service engineer, will have its headquarters temporarily located at 18802 Fonthill, Torrance, Calif.

Weekly has been active in all phases of cleaning, plating and finishing metals for twenty years. He is a charter member and past-president of the Indianapolis Branch, American Electroplater's Society.

Gardner-Denver Expands Foundry Facilities At Quincy Plant

Major part of an extensive expansion of foundry facilities at the main plant of the Gardner-Denver Company here has been completed, according to G. V. Leece, president.

Included in the additions are new sections in the iron foundry for cleaning castings and floor molding work, a core oven room and lockers and wash-up facilities, plus a new brass foundry. The 50 by 280 foot building and equipment involved an outlay of some $500,000 and are part of a long-range program to increase production and improve efficiency, Leece said.

The brass foundry was moved from the Walton Heights plant to Plant 1 as part of the program that began in October, 1955, he said. A further step in the growth of the firm's facilities is a chemical and metallurgical laboratory that will soon be completed.

Modern equipment to make working conditions as satisfactory as possible is located throughout the factory addition. Ceiling fans exhaust fumes and dust. Two banks of windows, one at eye level and the other above, provide both ventilation and light. Electrical fixtures provide additional light at work stations.

Statistics on scrap point to the efficiency of the new foundry operation, Leece said. Recent figures show foundry scrap was only three-fourths of one per cent, a comparatively low figure for the industry. • • •

NEW PLANT OF AUSTRALIAN TIMKEN PROPRIETARY LTD. It will be the first company to produce tapered roller bearings in Australia.

Timken Expands to Australia

Construction of the building that will house the Timken Roller Bearing Company's bearing producing facilities at Ballarat, Victoria, Australia, is now underway.

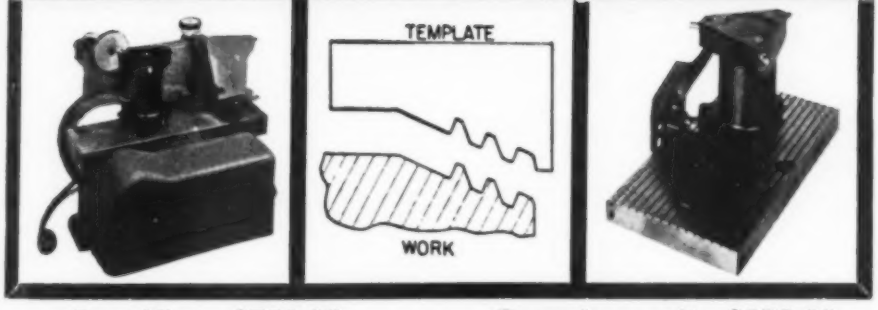
Australian Timken Proprietary Ltd. will be the first company to produce tapered roller bearings in that country. The new building will contain 30,000 sq. ft. of floor space with a producing capacity of 1,000,000 bearings a year. Production from this plant will be supplemented by bearing shipments from the United States and Canada, providing a complete range of bearing sizes to that part of the world.

It is estimated that the first building will be completed in one year. The plant will be built on a 125 acre tract. Ballarat is located about 50 miles inland from Melbourne.

Elmer Schweitzer, previously manager of the Timken Company's Zanesville plant, is managing director.

the Contour Rex RECTIFIER

NEW WAY TO PRECISION-FORM GRINDING WHEELS USING ONE TO ONE TEMPLATES and TOTALLY NEW RECTIFIER TO CORRECT TRACER FOR WEAR OF DIAMOND



Rectifier, $750.00

- Combines checking and trueing of tracer and diamond relationship.
- Tracer rectified by half-rotating motion of diamond head. Tracer ground against small grinding wheel directly below.
- Checking done with similar motion on side of indicated square preset to split .0005".
- Master square and holder for checkers included.
- One rectifier used for several dressers.

Dressing unit, $230.00

- Combines platen and diamond head. 3 diamonds and 3 tracers. Diamonds not included.
- Form dresses **hard** as well as soft wheels without removing work from grinder.
- Smallest inside radii and fillets limited only by point of diamond.
- Prices subject to change.

No form too large or too small—fits any grinder.

FORM-ALL MANUFACTURING CO.
Providing: "The Engineering Service for ALL Form Grinding"
364 Glenwood Avenue East Orange 3, New Jersey

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PRESSURELOK®-224 RESINOID DIAMOND WHEELS

The *Best* Diamond wheel ever developed

- U.S. DIAMOND'S PROVEN REVOLUTIONARY "PRESSURELOK"® Process increases Diamond holding efficiency by 300%.
- Positively no danger of heating or cracking carbide with the most rapid stock removal.
- Use dry or with coolants.
- They are consistently super-finishing, out-producing, under-costing any other Diamond wheel ever produced . . . and they are always readily available.
- If you have used them, you know they are the best! . . . If you haven't, let us show you!

U S

UNITED STATES DIAMOND WHEEL CO.
835 ILLINOIS AVENUE
AURORA ILLINOIS

Use postpaid card. Circle No. 259

HONING LAP

Highly efficient, ATECO's new Honing Lap removes material fast. It's convenient—economical — durable — produces an absolutely smooth finish on tool steels and on the hardest carbide tools. Macolaepp grains used in the new ATECO lap are harder than the toughest sintered carbide. Long life, even cutting action guaranteed.

95% diamond hardness at 1/3 diamond cost!

$8.75

There is a proper ATECO Honing Lap for each job, depending on the finish desired and amount of material to be removed. Grits —160, 220, 360, 500.

Write for full details!

MICRO DIVIDER SETTER

A new device for precision setting of dividers, Accuracy to .001" Valuable aid to tool makers, draftsmen, lofting engineers, and layout men. Complete with case $7.50

ATECO

AIR TRANSPORT EQUIPMENT, INC.
AMITYVILLE NEW YORK

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Fixture for Holding Irregular Pieces on Centerless Wins Award

• Joseph B. Campbell, a production machinist in the grinding department of the Chandler-Evans division of Pratt & Whitney Company Inc. of West Hartford, has won $40 for a new idea he recently submitted to the division's suggestion award committee.

Mr. Campbell's idea, the first he has ever submitted, is a hold-down fixture used on a centerless grinder for centerless grinding of off-balance pieces and parts with outside diameters.

The device is designed for the machining of a number of various parts.

Mr. Campbell's suggestion of using an over-head fixture to hold-down irregular and off-balance pieces to be ground replaces the former method of grinding irregular pieces at slow speeds and frequently with a dressed wheel to eliminate pressure. Off-balance pieces formerly were ground from a "Vee" rest set up in front of the blade.

Chandler-Evans manufactures aircraft accessories, including fuel and afterburner controls, pumps and regulators used on most of today's advanced jet aircraft. • • •

Reading Chapter of Abrasives Society Chartered

National Headquarters of American Society for Abrasives has announced that a charter has been granted to a chapter of the Society recently organized at Reading, Pa. The Chapter now has 35 members, who are preparing for a series of meetings beginning in the early fall.

Officers are: president—Kenneth S. Weidner; vice-president—Howard Burkhart; secretary—Paul A. Miller; treasurer—Joseph M. Acker.

Make accurate set-ups *faster* with this

25° Tilting Spindle

The STERLING Model "G-2" Universal Tool and Cutter Grinder provides this extra feature plus complete versatility and more capacity than comparable machines at *lower cost.*

Swing 10¾" over table, 27" between centers, 18" table travel with 8¼" cross feed. For complete details and specifications write for FREE Bulletin "G-2".

Grind 90° to 140° Included Angle on *ALL DRILLS*, ⅛" to 2½"

No collets or chucks makes set-ups easy. Clearance gauge insures accurate, positive clearance angle. True conical grinding produces full clearance from center to outside. Write for FREE Bulletin "DV-1".

McDONOUGH MFG. CO.

1522 GALLOWAY • EAU CLAIRE, WISC.

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Abrasive and Ceramic Products Manufacturer has capacity available. Equipment—Pug mills, Simpson mixer, Haller press and gas fired Kilns. Low overhead costs.

GRINDING & FINISHING
222 E. Willow, Box No. 14 Wheaton, Ill.

Carbide Form Grinding, Inc.

Specialists in Die Sections and Cutting Tools.

1406-45th St. Brooklyn 19, N.Y.

HOFFMAN
INSTALLATIONS PAY THEIR WAY
AT FAFNIR

HOW HOFFMAN FLOTATION UNITS HELP MAKE BETTER BALL BEARINGS

before

the installation of money-saving Hoffman Flotation Units in the Fafnir Bearing Co. plant, these were among their coolant clarification problems:

1 — Short wheel life

2 — Part rejects

3 — Daily cleaning of each machine

4 — Dirty machines with resulting bacterial odor

after

the changeover to a central system in the Fafnir Bearing Co. plant and the utilization of Hoffman Flotation Units, these changes took place:

1 — Extended wheel life

2 — Improved quality, uniformity of parts

3 — Reduced machine clean-up time

4 — Bacteria and resulting odor eliminated

HOFFMAN FILTRATION SYSTEMS custom designed for your needs

Call your Hoffman representative or write for Bulletin A690 for further information

INDUSTRIAL FILTRATION DIVISION U.S.HOFFMAN MACHINERY CORPORATION 103 FOURTH AVENUE, NEW YORK 3, N. Y.

Other industrial equipment — by Hoffman: **AIR APPLIANCE DIVISION,** Multistage Centrifugal Blowers & Exhausters — Industrial Vacuum Cleaning, Portable and Stationary Systems — **PNEUMATIC CONVEYING DIVISION** — Custom Built Systems.

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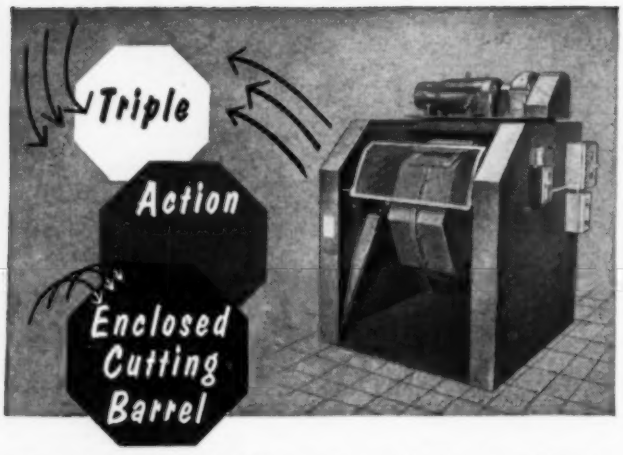

The Finest Cutting Barrel Ever Made

Hartford's great new enclosed barrel speeds deburring, descaling, polishing on screw machine parts, stampings, and castings. Hartford's unique *Triple Cutting Action* produces the highest degree of uniformity . . . faster . . . at lower cost. Extremely compact with every modern feature for efficiency, safety, and cleanliness. Available in 4 and 10 cu. ft. barrel capacities. Write for complete literature.

Hartford

PRECISION BALLS • RETAINERS
BEARINGS • TUMBLING BARRELS

Hartford Steel Ball Co., Inc., 111 Jefferson, W. Hartford 6, Conn.

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LEA GRIPMASTER®

Industry's Abrasive { BONDING CEMENT for Wheels and Belts

SIZES AS WELL AS BONDS

Gripmaster cuts out one preparation material and one preparation step. No special sizing is necessary. This superior bonding cement has a double use. But seein' is believin'. Test Gripmaster in your own plant under your own working conditions. Send us the enclosed coupon or use your company stationery and we'll send you a test size sample *without charge or obligation.*

LEA-MICHIGAN, INC.

14066 Stansbury Ave., Detroit 27, Michigan

(A member of the well-known Lea Group of Finishing Specialists)

Lea-Michigan, Inc.
14066 Stansbury Ave.
Detroit 27, Mich.

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☐ Please send us literature giving full details.

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Company_____

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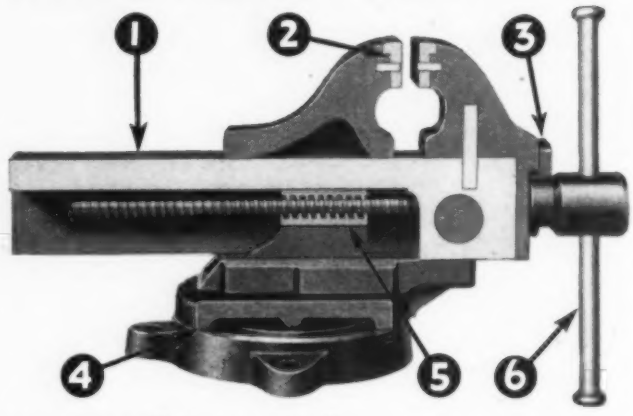

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It makes sense to standardize on Desmond-Simplex vises. You pay no more, but you get more: 1. All-steel slide, milled from "the solid." 2. Step-milled jaw inserts. 3. Outside screw retainer. 4. Full 360° swivel base. 5. Longer, stronger vise nut. 6. Non-pinching type handle. Write for catalog and name of your Desmond distributor.

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Save with Sandblasting!

Do all these operations better, faster, at lower cost with

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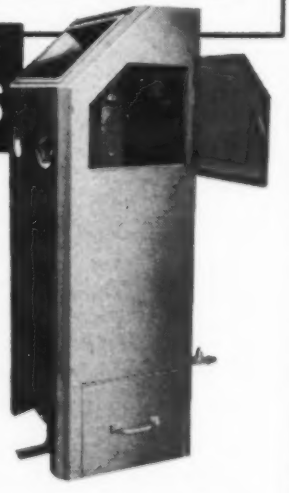

Whether you work on metal, glass, plastics, compositions . . . whether on production runs or single pieces, large or small—you'll find countless uses for versatile Leiman Sandblasts. Easily operated by unskilled help. Require little floor space. Use all types of abrasives. Well-designed, rugged, priced right, last for years.

Send for informative bulletin "Sandblasting", plus catalog showing complete line.

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Company Briefs

Two Michigan firms who represent manufacturers of air moving equipment; air filter, dust control, heating and ventilating products; and steam heating specialties, have consolidated. **Marshall & Wells Co.,** headed by Robert L. Wells, Grand Rapids, and **Air Engineering Co.,** Kalamazoo, headed by Frank K. Platt, have consolidated their operations. The main office for the new organization will be 521 South Burdick St., Kalamazoo, Mich., with branches in Grand Rapids, Mich., and South Bend, Ind. Personnel of both firms will remain intact.

Plans to establish an annual miniaturization award which will recognize the greatest contribution by an individual or firm to the advancement of the concept of miniaturization were announced recently by Horace D. Gilbert, president of **Miniature Precision Bearings, Inc.,** Keene, N. H. An independent committee of miniaturization authorities representing industry, education, government and technical publications will administer the award. Members of the award committee will be announced shortly, Gilbert said.

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PRECISION DIAMOND TOOLS

Industrial Diamonds
Thread Grinders
Turning Tools
Engraving Tools
Dressing Tools
Diamond Powder

Manufacturers of
DIAMOND TOOLS
and
WHEELS

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PHILADELPHIA, H. J. MILLER, Valley Brook Rd. and Glen Mawr Dr., Ambler, Pa.
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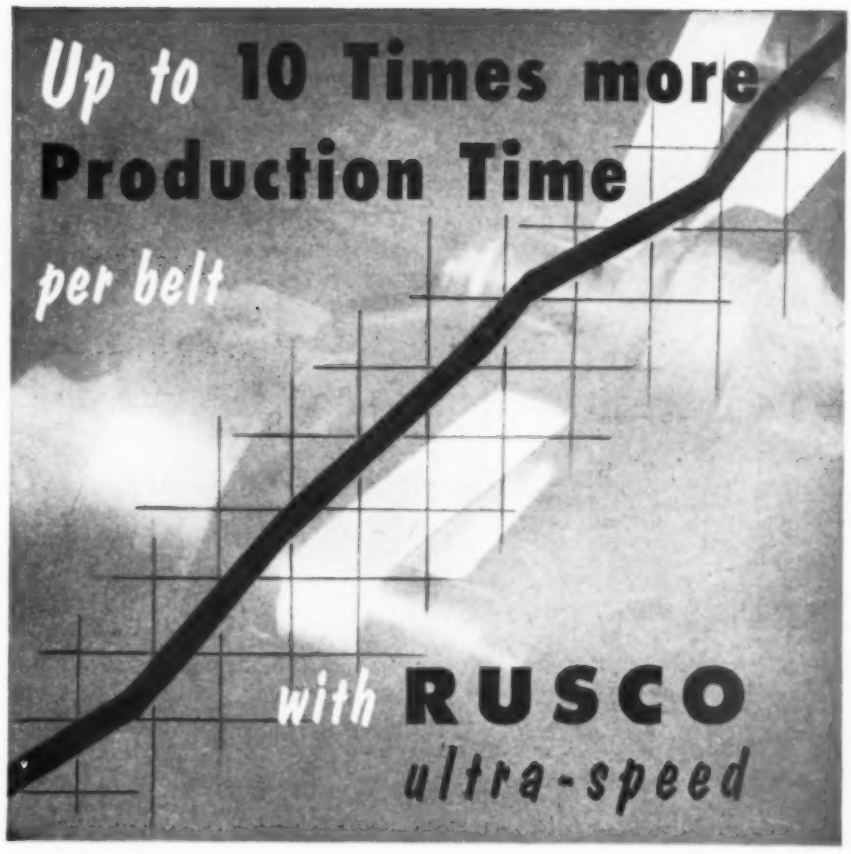

Performance records almost beyond belief are being reported by Ultra-Speed users across the country. As a replacement belt on high speed equipment, Rusco Ultra-Speed lasts as much as 10 times longer than all other flat belts of comparable size.

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ENGINEERED FABRICS SINCE 1834
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Company _____

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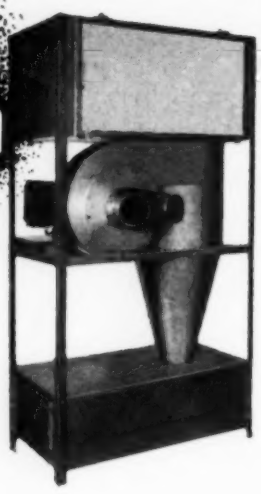

Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units; or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

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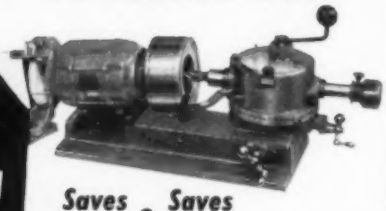

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THE WILCO MACHINE TOOL CO., INC. has moved office, engineering and production employees and all equipment from Manchester, Conn., to their new plant on Route 6 in Bolton, Conn.

New exclusive sales representation for the state of Iowa has just been announced by **Size Control Co.,** Chicago, manufacturers of precision gages. **The Johnson Tool & Supply, Inc.,** of Des Moines, will cover that territory through its several offices. Specializing in the sales of precision toolroom equipment, the Johnson firm is well known throughout the Hawkeye state for cutting tools, abrasives and diemakers supplies and handles many prominent lines in addition to Size Control. At the Des Moines office (204 East Court Avenue), Dan Mollhon and Jim Weirich are in charge of sales, while Howard McNeal works out of the Cedar Rapids office at 107—10th Street, N.E. Owner John Johnson covers the Sioux City area and supervises all operations.

Clary Corp., San Gabriel, Calif., has announced consolidation of its aircraft division and automatic controls division into a single unit to be named Clary Dynamics. **Paul J. Meeks,** vice president of the parent company, will be general manager of the new division, which will develop and manufacture aircraft and guided missile components. **Brian Sparks** will be assistant general manager.

Precise POWER QUILLS

CUT ASSEMBLY TIME 55%

AT ALLIED CONTROL CO.
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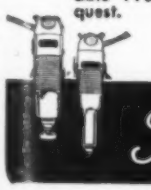
Case History M-100

PROBLEM: A nylon-encased component for an electrical relay to be precision sized by milling both ends.

SOLUTION: Two PRECISE SUPER 50 POWER QUILLS mounted through plane mounts above and below working surface. Relay part is inserted between two .087" diameter carbide end cutting mills — milling completed to close tolerance as fast as operator can load and unload the fixture. Actual reduction in assembly time over previous method of operation — 55%!

Other Power Tools from ⅛ to 1½ H.P. and complete line of accessories described fully in our catalog, available Free on request.



SUPER 50 POWER QUILL PRECISION Features

1. Super Speeds—to 45,000 RPM at high torque under load.
2. Precision ground — satin chrome finished Steel Housing only 2½" D. and 9½" overall length.
3. Ground and honed Collet Chuck with up to ¼" capacity.
4. Available with complete line of mounts, filtration units and electric speed controls.
5. Used singly or in multiple set-ups.
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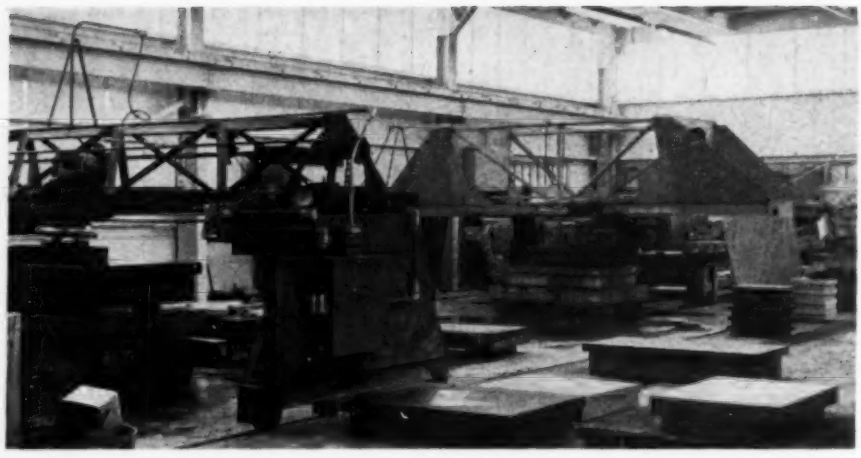

THE HERMAN STONE COMPANY, has opened a new manufacturing plant in Mount Airy, N.C. Built of granite blocks, the two-story plant cost over $100,000. Mount Airy granite is said to have a high silica content, providing approximately 30% quartz and a desirable mineral balance for making surface plates of high accuracy and lasting abrasion resistance.

RIBON UNIVERSAL GRINDERS

Electro mechanical and hydraulic models produced by one of Europe's largest grinder manufacturers—completely universal with swinging internal grinding heads. 14" x 2" x 5" O.D. wheel with 3 H.P. and 18000 and 35000 I.D. spindles with 1½ H.P. Long conical adjustable plain bearings in both wheelhead and workhead with automatic pressure oil bath lubrication. All machines have automatic table traverse and infeeds.

11" x 20" Electro Mechanical Grinder ...$3450.00
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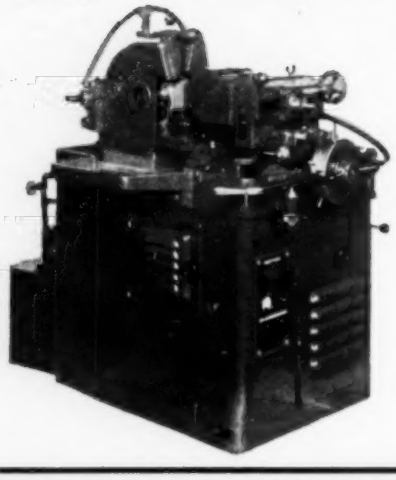

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Close tolerance production units capable of .0001" tolerances in production. Long conical adjustable plain bearings on both grinding wheel and feed wheel spindles with pressure oil bath lubrication. Equipped for bar feed, thru feed, and infeed work with automatic ejectors and automatic cycling on infeed where desired. Diamond or crush dressing on both wheels with contour form and taper dressing of wheels by either hand feed screw or hydraulically.

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THE AMERICAN HERFORDER CORP.
1801 W. COLUMBIA AVE. CHICAGO, ILLINOIS

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Firth Sterling Inc. has announced the adoption of two new trade names, Stercon and Stervac, to clarify the difference between consumable electrode vacuum melted alloys and induction vacuum melted alloys. Stercon designates the former type of melting process and Stervac the latter. Stercon A-286, Stercon Discaloy, Stervac M-308, and Stervac Waspaloy, as well as other alloys, are now available through Firth Sterling district sales offices. The significant difference in the two melting processes is that the electrode used in the consumable electrode vacuum melting process is usually air arc melted as the first step, while the original charge and alloy additives used in the induction vacuum melted process must be of the highest purity and their cost runs two to three times more than that of the alloys used in normal air arc melting practice.

The Bay State Abrasive Products Co. has purchased fifteen acres of land in the Keith Shaffer Industrial Park in the Opal Cliffs-Capitola sector of Santa Cruz County, Calif. The company is making plans to build a manufacturing plant and warehousing facilities at this location but the construction date has not been announced. This is the latest step in the company's $2,000,000 expansion program announced a year ago.

Pennsalt Chemicals Corp., Philadelphia, has selected a ten-acre area near Oakville, Ontario, as the site of its first plant in Canada. The one-story, brick structure already under construction is expected to be completed in December '57.

A new tool stocking distributor program aimed at broadening its product coverage and improving customer service has been announced by the **abrasives division of Elgin National Watch Co.** They expect to have a nationwide distributor plan in operation by the first of the year. Distributors already named and their territories include, in Arizona: **Roy J. Heyne Machine Co.**, 707 Buchanan St., Phoenix, and **Circle Sales Co.**, 9151 N. Ninth Ave., Phoenix; in northern Ohio, **Clark-Campbell Tool Sales Co.**, 4673 Landchester Rd., Cleveland; and in central Indiana, **Browning Tool and Supply Co.**, 332 N. Capitol Ave., Indianapolis.

The Tube Turns division of National Cylinder Gas Co., Louisville, will increase its manufacturing area approximately 40 percent by converting buildings on property adjacent to its main plant. A $400,000 construction contract has been signed to connect three existing buildings, creating a new manufacturing area under one roof.

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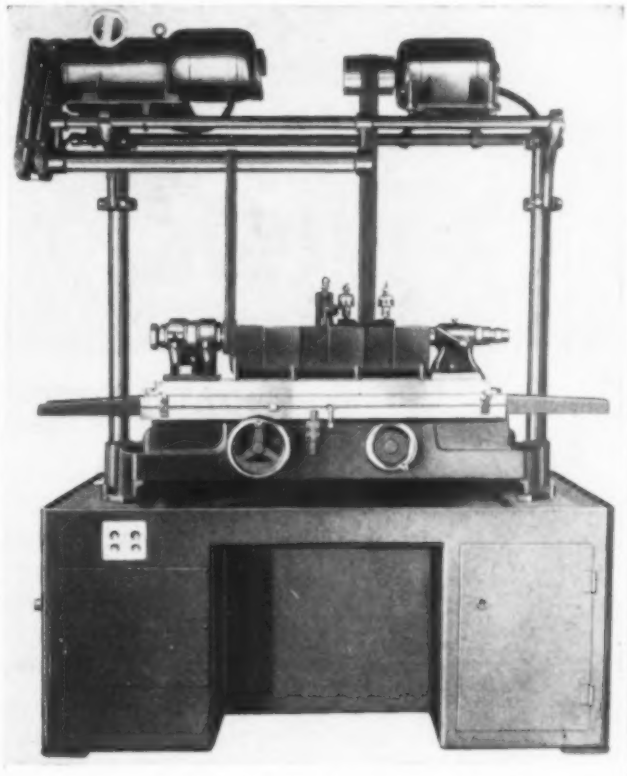

A choice of General Electric Thymotrol, General Radio Variac, or Variable Speed Drive can be used without ripple or cine' wave being transmitted to work as all motors are mounted on self-contained countershaft.

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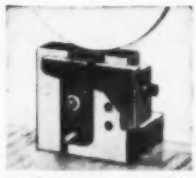

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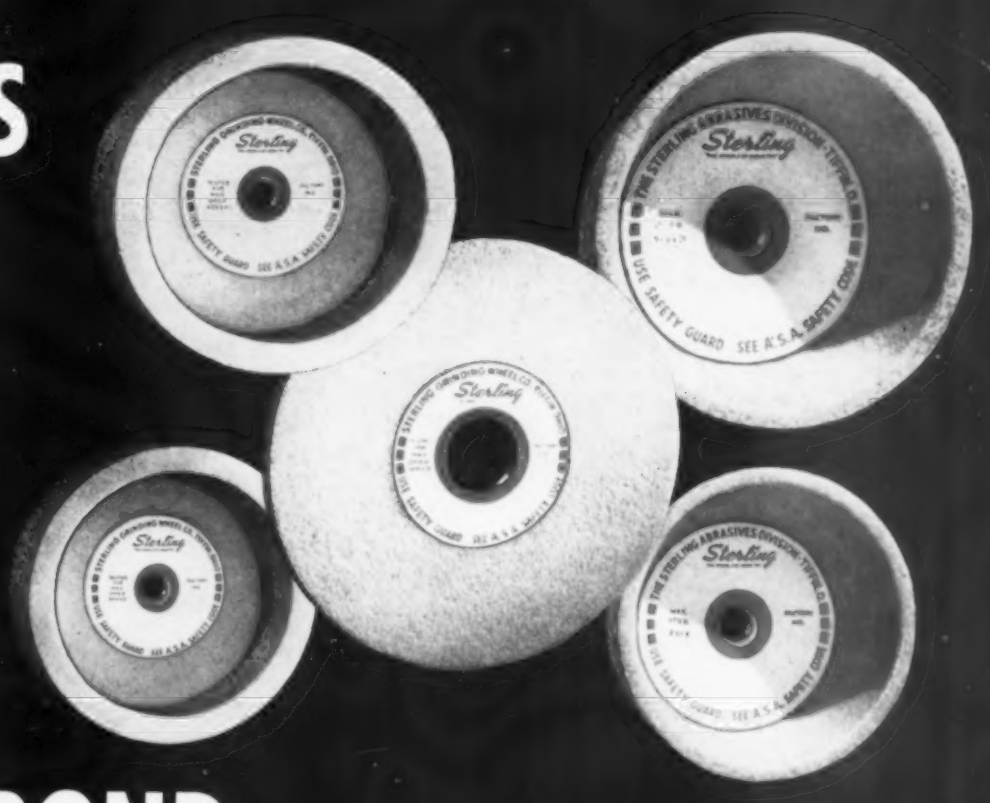
STERLING'S *New* V2 BOND assures extra economy and efficiency from these precision grinding wheels..



V2 + EA = $ Saved!

For premium performance without added cost, use the winning combination—V2 bond and EA grain. Where medium pressures are the rule and hard steels encountered, you will do no better anywhere than to use V2 + EA—Sterling's answer to more economy and efficiency from every wheel you use.

Recent development and research have lifted Sterling's new V2 bond to new heights of efficiency . . . created new all-purpose grinding wheels that outlast ordinary abrasive units and save you money while doing it.

Available in a wide range of structures and grain sizes, Sterling's "Wheels of Industry" with V2 bond will definitely improve your existing standards and demonstrate unusual savings.

When Sterling's abrasive engineer next calls on you, challenge him to prove the value of Sterling's precision grinding wheels with new V2 bond. Permit him to analyze your operations and get that last drop of economy from every job. No obligation, naturally!

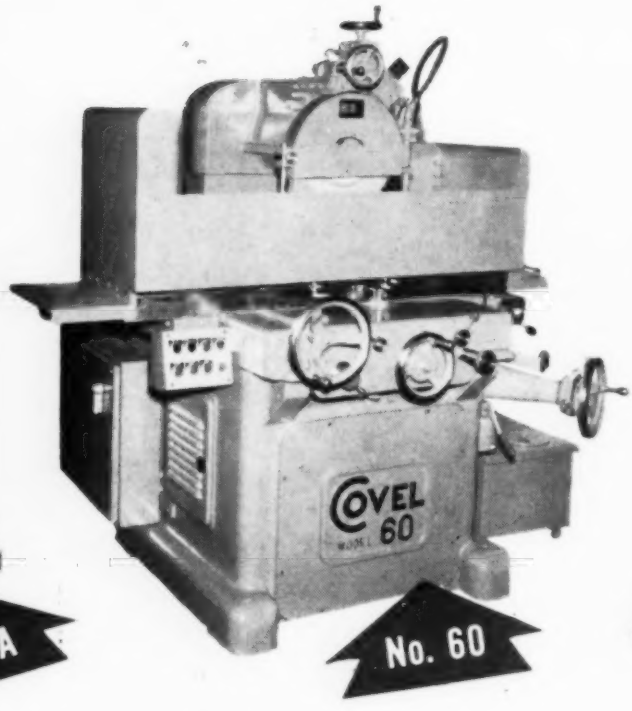
STERLING GRINDING WHEELS

THE WHEELS OF INDUSTRY — STERLING

STERLING GRINDING WHEEL CO., TIFFIN, OHIO—SUBSIDIARY OF ABRASIVE AND METAL PRODUCTS COMPANY

Distributors and Direct Representatives Located in All Principal Cities

for accuracy, performance, value, choose COVEL PRECISION SURFACE GRINDERS



Precision *plus* describes all these Covel Surface Grinders. It will pay you to investigate all the Covel advantages and see why they are the preferred machines for production and tool room work. All these Covel machines feature hardened and precision ground lead screws, timing belt drive and hard chrome table ways available for longer accuracy.

	Work Capacity	Grinding Wheel	Write for Bulletin
7A	6" x 12" x 11¼"	7"	D-756
10	6" x 18" x 15"	7"	D-104
17	10" x 16" x 14"	12"	D-176
35	8" x 24" x 11"	12"	D-353
60	14" x 24" x 18½"	14"	D-603

Covel also offers a complete line of Cutter and Tool Grinders and Drill Grinders. The Covel No. 14 Optical Comparator puts precision checking within the reach of every shop.

WRITE FOR FREE DESCRIPTIVE BULLETINS.

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN